July 1966

culture

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Spare-time Cattle Rearers . . . . . *A. W. Prowel*
Market Intelligence and Outlook work in the U.S.A. . *H. F. Marks*

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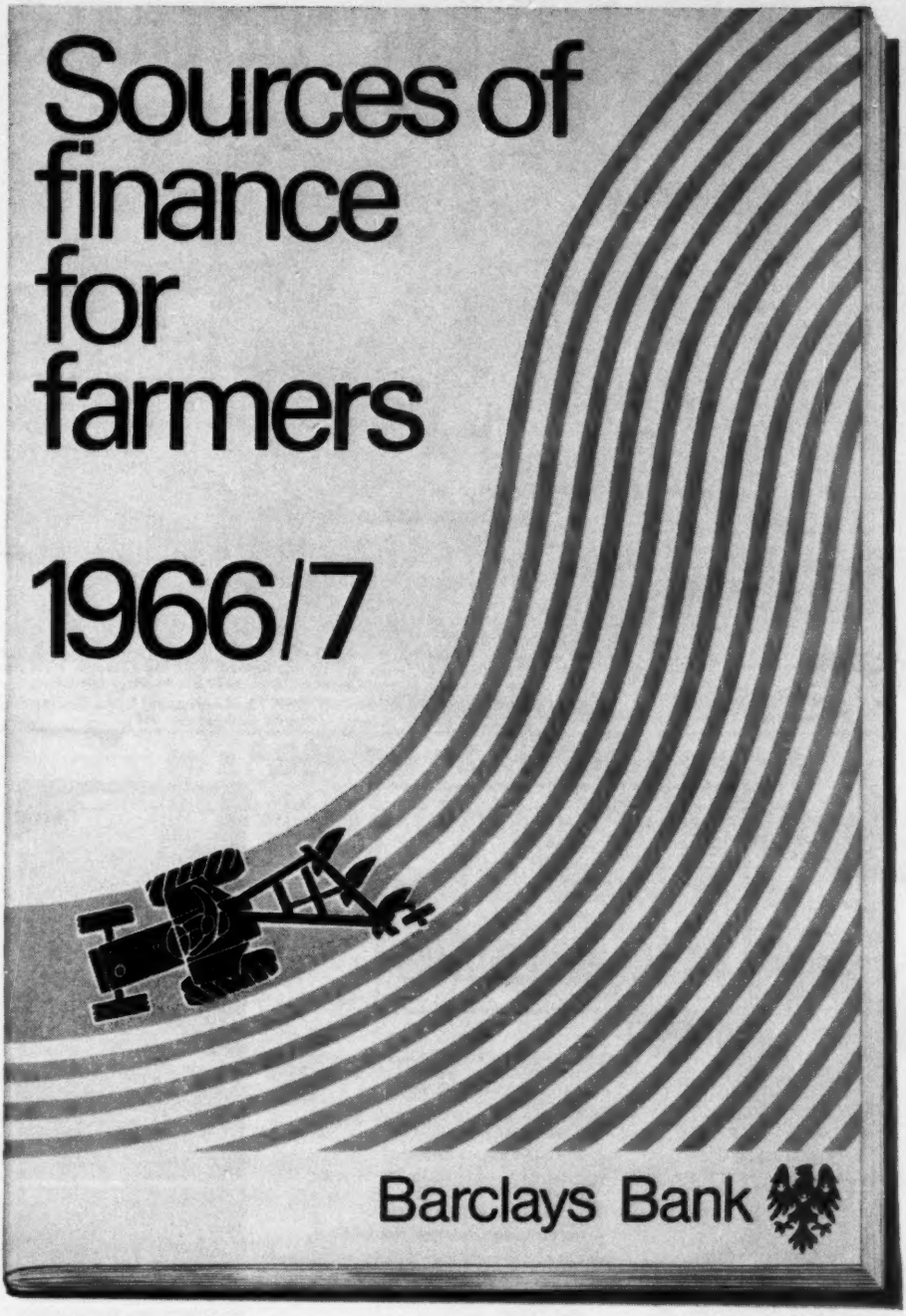

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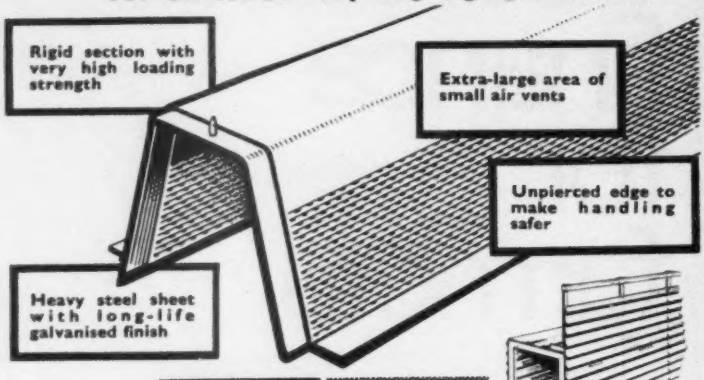
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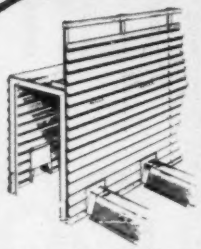

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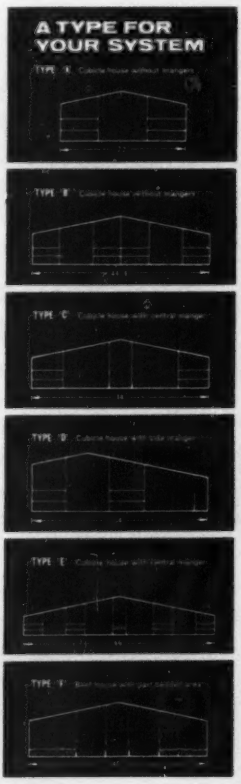

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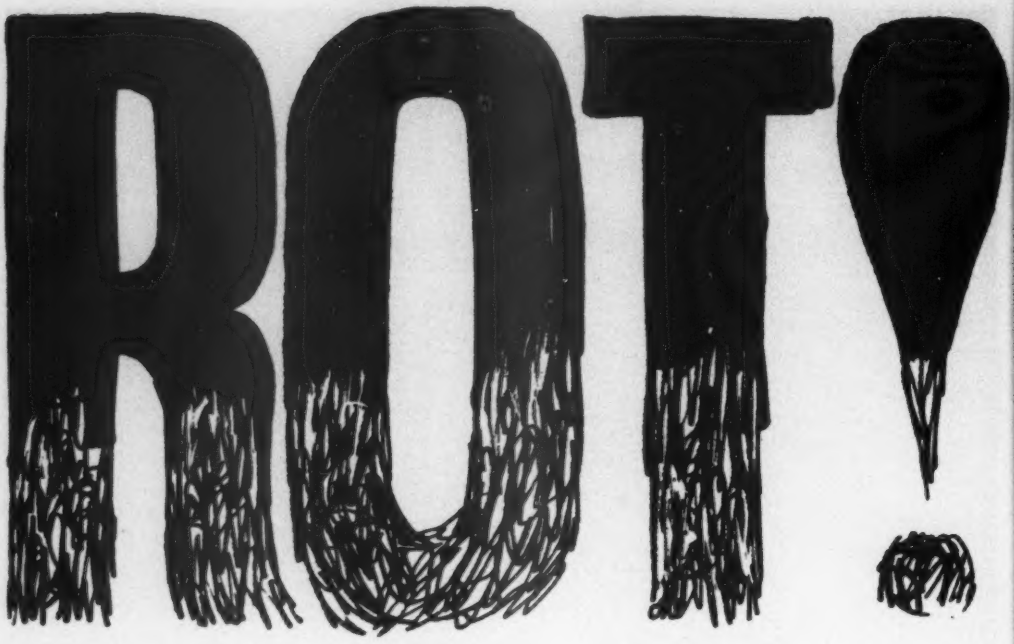

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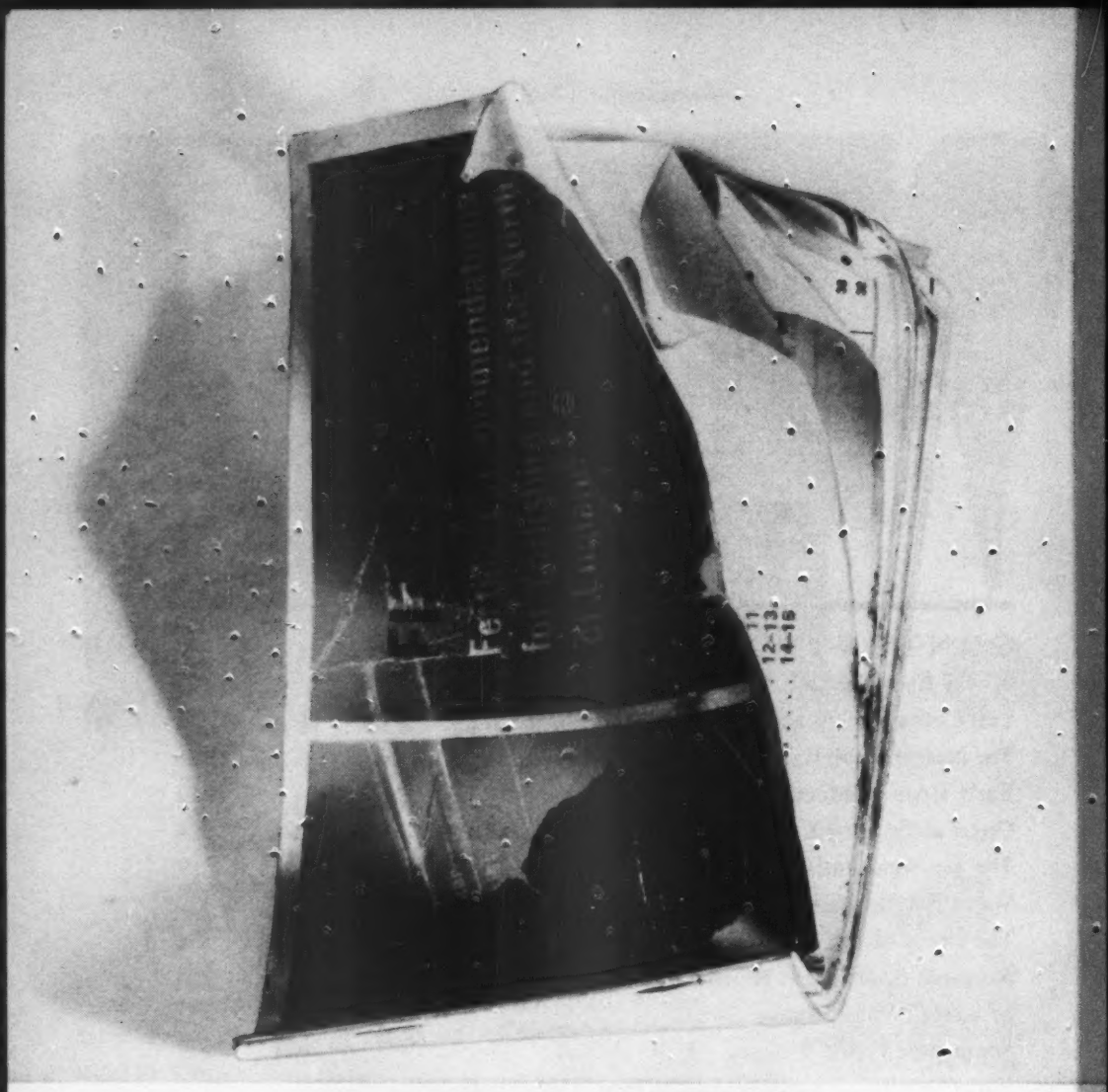

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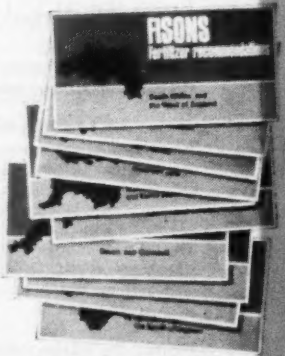

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Wheat Bulb Fly

Field trial testing new insecticides as seed dressings for wheat bulb fly control

JULY sees the start of egg-laying by the wheat bulb fly. For the last few years the average egg-count of suitable fields, mostly fallows and root crops, has been rising steadily, certainly in the 'traditional' wheat bulb fly areas. Various possible explanations have been advanced to account for this. We know that control by organochlorine seed dressings has never been more than about 80 per cent effective, and modern ecological theory suggests that partial control may in the long run be worse than no control at all. On the other hand most species of animals have cycles of abundance alternating with scarcity, and it may be that we are at the moment experiencing one of the peaks in a natural cycle of this sort.

The National Agricultural Advisory Service will, as usual, be taking soil samples from a random selection of suitable fields in the wheat bulb fly areas this autumn. On the basis of the numbers of eggs found in these samples, farmers and seed merchants will be advised whether or not seed dressing is likely to be worth while for the 1967 crop.

Work on improved control measures continues, and some very promising new materials are being tested as seed dressings (see illustration above) and as granules. At the same time many farmers are finding that the new spring wheats, such as Kloka and Opal, are capable of giving a yield at least as good as that of their normal (wheat-bulb-fly-attacked) winter wheat varieties. Sowings made after mid-March are free of risk from this pest, and where yields of winter wheat are falling much below two tons per acre because of wheat bulb fly, spring wheat should be seriously considered.

D. W. EMPSON

The Cost of Early Fat Lamb

artificial *versus* natural rearing indoors

F. J. Willis **T. E. Kinsey**

THE profitability of Easter fat lambs, produced mainly indoors, has long been in dispute. Farm advisers have always assumed that the ewe is an expensive middle-man under such a system but there is little published data available on recorded food costs and liveweight gains. We were anxious to investigate the economics of early lamb and, in the same context, to look at the possibilities of early weaning as outlined by J. B. Owen and D. A. R. Davies of Cambridge University (*Agriculture*, February, 1965).

We were most fortunate in being able to secure the unstinted co-operation of the Belvoir Grass Drying Co. Ltd. in an observation study which was conducted on their farms from July, 1965, to May, 1966. Thirty aged ewes, Suffolk x Welsh half-breds, were put at our disposal for a simple trial designed to compare cost and performance of suckled lambs with others which were removed from their dams at two days old and reared on milk substitute. These ewes had lambed at the end of March, 1965, and would normally have been sold as culls after the weaning or sale of their lambs. They were sound in the udder but broken-mouthed and of uncertain age.

Synchronized lambing

To catch the early lamb market it was considered necessary to mate the ewes to lamb again in January, 1966. As the lambs were to be randomized into two groups almost immediately after lambing, we decided to try out the new 'Syncro-Mate' pessary to achieve maximum lamb fall within the space of a week from 10th January. The ewes were isolated from all rams from 1st June onwards as we thought that this would help to stimulate the mating urge when rams were joined in August. On 15th July their remaining lambs were removed, also to assist early mating, and the ewes were kept inside on dry food for two or three days until udders showed no undue distension.

On 20th July 'Syncro-Mate' pessaries (polyurethane sponge pessaries impregnated with a progesterone derivative) were inserted in each ewe. The ewes were then moved to a fresh (old) pasture for flushing. All pessaries were removed on 31st July and, on the same date, each ewe received an intra-muscular injection of 750 i.u. freeze-dried pregnant mare serum to stimulate ovulation. Two Suffolk rams were run in on 10th August to catch the ewes at the second heat after treatment; optimum conception rates are seldom achieved at the first heat. The P.M.S. injection may not be necessary with Suffolk cross ewes which are normally lambing early each year, but it should be remembered that these ewes had previously lambed in March. Rams were left with the ewes for three weeks only and owing to the hot weather, and abundant flies, their crayon harnesses were unfortunately dislodged repeatedly during this time. It was therefore not possible to keep accurate records of matings.

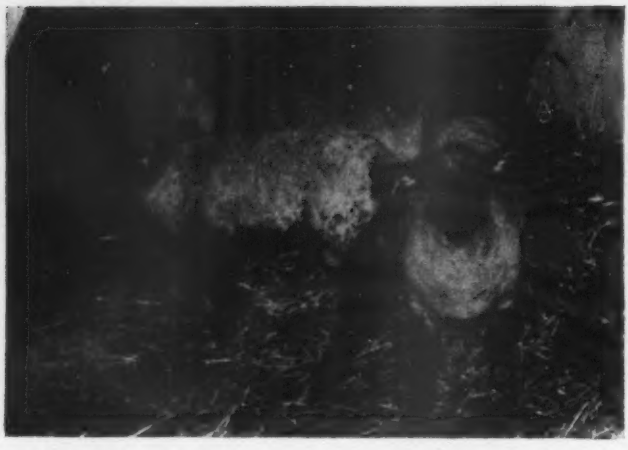
Management during pregnancy

After mating, ewes grazed an old pasture, receiving no hand feed until the third week in October, when they had about one pound per day of chat potatoes until housed on 10th December. From six weeks before lambing they were 'steamed up' on proprietary ewe nuts, starting with ½ lb daily and rising to 1½ lb at lambing. This is standard farm practice. No supplementary roughage was fed until the ewes were housed; thereafter they were allowed up to 8 lb silage and 1 lb hay per head daily.

Lambing and subsequent management

The success of the synchronizing technique may be judged from the fact that 27 ewes lambed 42 live lambs between 10th and 15th January, one lambed twins three weeks later and two proved barren. One ewe died very soon after a difficult lambing and her twins followed suit within 24 hours; one other lamb was a reluctant suckler and died within two days of birth.

Twenty-six ewes and 39 lambs were available for the subsequent observation study and these were randomized into roughly equal groups by sequence of lambing. Twenty lambs sucked their 13 dams and, of the twenty, 14 were twins and 6 singles; there were 12 twins and 7 singles in the early-weaned group. This bias was counterbalanced, quite by chance, by the fact that the male/female ratios were tilted in the other direction, i.e., 14:6 for those suckled and 11:8 for the weaned lambs. Average birth weights of the two groups were almost identical.



Four-week-old suckled lambs showing slightly more bloom than the weaned lambs on the opposite page

TABLE 1

Costs and returns

Early-weaned group 13 ewes 19 lambs	£	*s.*	*d.*	*Suckled group* 13 ewes 20 lambs	£	*s.*	*d.*
Value of ewes @ £3	39	0	0	Value of ewes	39	0	0
Feed costs				*Feed costs*			
Hay to ewes (weaning to sale): 4 cwt @ £10 per ton	2	0	0	Silage: 90 cwt @ £2 10*s.* per ton	11	5	0
Hay to lambs 1¾ cwt		17	6	Hay: 10 cwt @ £10 per ton	5	0	0
Ewe milk replacer: 323 lb @ 1*s.* 6*d.* per lb	24	4	6	Ewe nuts: 20½ cwt @ 35*s.* 3*d.* per cwt	36	3	0
Calf weaner pencils: 179 lb @ 42*s.* 6*d.* per cwt	3	8	0	Calf weaner pencils: 97 lb @ 42*s.* 6*d.* per cwt	1	17	0
Barley beef pellets: 25 cwt 96 lb @ 34*s.* 6*d.* per cwt	44	12	0	Barley beef pellets: 10 cwt 46 lb @ 34*s.* 6*d.* per cwt	17	19	0
Total feed costs	£75	2	0		£72	4	0
Returns				*Returns*			
13 ewes	70	14	0	13 ewes	50	14	0
19 lambs	123	8	0	Wool 84 lb	18	0	6
				20 lambs	165	11	10
	£194	2	0		£234	6	4
Margin to cover costs of ewes to lambing, labour and miscellaneous costs	80	0	0	Margin to cover costs of ewes to lambing, etc.	123	2	4
Margin per lamb	4	4	3	Margin per lamb	6	3	0

N.B.

1. No feed or grazing costs are included for the period from tupping to lambing.
2. Concentrate prices are somewhat inflated because these were special mixes; copper was excluded from the usual mineral supplementation in view of findings elsewhere that it may be toxic to housed sheep.
   Ewe milk replacer has been charged at the 5 cwt price ruling at time of delivery.
3. The cash returns shown for ewes and lambs are net figures.

TABLE 2

Comparisons of lamb performance

	Early-weaned group	*Suckled group*
No. of days to slaughter	109	90
Av. live weight at slaughter	69·6 lb	73·0 lb
Av. liveweight gain per day	0·52 lb	0·67 lb
Av. dead weight	32·3 lb	38·1 lb
Av. killing-out percentage	46·5%	52%
Av. sale price per lamb	£6 9*s.* 11*d.*	£8 5*s.* 7*d.*
Av. price per lb dead weight	4*s.* 0½*d.*	4*s.* 4*d.*
Av. food cost per lb liveweight gain*	16·6*d.*	14·4*d.*

*Including cost of food fed to ewes.

Suckling ewes

Suckling ewes were initially allowed a proprietary ewe nut *ad lib.* plus free access to grass silage (D.M. 22 per cent, pH 5·0, D.P. in D.M. 13·8 per cent—slightly butyric) and moderate seeds hay (C.P. 7·7 per cent, Fibre 31·7 per cent, Est. S.E. 22). Voluntary intake per day at this stage was 3 lb nuts, 8 lb silage and 1 lb hay. After the first fortnight, ewe nuts were rationed at 2 lb per head per day, later reduced to 1½ lb. Total food consumption is shown in Table 1 on page 304. The food consumption of their lambs is detailed in the same table. They were allowed free access, by creep, to *ad lib.* calf weaner pencils from the first week. The creep food was gradually changed to a 'barley beef' type pellet when the lambs were 4 to 5 weeks old; the 'weaned' lambs did a similar switch as the feeding of liquid ewe milk replacer was discontinued. The suckled lambs were sold by dead weight and grade, in two draws (5th April—9 lambs and 19th April—11 lambs); they averaged 90 days to slaughter and all but two graded A. Details of lamb performance will be found in Table 2 above; final live weights shown for both groups were unfasted weights. All the suckling ewes were shorn before being sold dead weight on 19th April.

Early-weaned ewes

Early-weaned ewes were removed from their lambs after two days' suckling and had dried off, without any udder complications, when they

Weaned lambs at four weeks old

Weaned lambs at twelve weeks old—far removed from the traditional type of 'cade' lamb

were sold about a fortnight later in a local auction mart. Their lambs were multiple suckled, in batches on a proprietary (high-fat) ewe milk substitute, after initial bottle training over a few days which called for considerable stockmanship. The teats on the suckling unit were too hard drawn at first and orifices had to be enlarged; within a fortnight the teats had to be replaced as lambs got stronger and considerable spillage occurred.

The milk substitute was fed at blood heat and in quantities approximating to those used by Owen and Davies, i.e., two pints per head daily, in four feeds a day for the first week, reducing to twice a day until weaning at four weeks old when they averaged 25·6 lb L.W. At this age they were 9 lb lighter than their suckled contemporaries and the differential climbed to 13 lb at 10 weeks. Like the suckled lambs, they had early free access to weaning pencils and hay, but not silage. After liquid feeding ceased, they were changed over gradually from weaner pencils to a 'barley beef' pellet. They were bedded on straw, group fed, and had constant access to hay and, of course, water. Average age at slaughter was 109 days; 17 graded A and two graded B.

Lambs from both groups were sold when considered to be gradable, if they had reached at least 70 lb live weight, but one lamb in each group was considerably under weight when the last batches were sold. There were no casualties in either group. All lambs received a booster dose of 'pulpy kidney' serum at 7 weeks old to reinforce the protection they had received in utero.

Discussions

All the sheep in this observation study were housed, from 10th December onwards, in turkey houses which were temporarily out of use. They could, however, have been accommodated in much more primitive buildings with similar results. Weaned lambs enjoyed the warmth of infra-red lamps for the first week. The suckled lambs, with two exceptions, made prime carcasses and killed out very well. This was probably due in no small measure to the fact that the ewes were generously supplemented throughout lactation. Any attempt to ration food unduly should be regarded as false economy; if lambs suffer a check at any stage, marketing can be considerably delayed.

The first draw (nine) caught the Easter market and the price per lb of the whole group at 3¾*d.* in excess of the 'weaned' lambs, reflects the bonus (including subsidy) that was available this year for earlier marketing.

Carcasses of the 'weaned' lambs were described by the wholesaler as 'quite acceptable to the trade' and realized similar prices to those obtained at the same time by conventionally-reared lambs from other sources. They were, however, considerably leaner than might have been expected from the way they handled live and their killing-out percentage was most disappointing. They might well have repaid more generous allowances of milk substitute, which they converted most efficiently, especially as they were heavier at birth than those reared by Owen and Davies. They could also have been kept to a greater weight but market prices and, presumably, their food conversion efficiency were falling. They did, in fact, convert their 'barley beef' pellets at 2.92 : 1 in the period from 6 weeks to slaughter.

The figures in Table 1 might suggest that early indoor lamb is a highly profitable form of production. It should, of course, be remembered that the food costs shown refer to a limited period only, that no labour or miscellaneous costs are included, and that an opening valuation is presented for the ewes, rather than the lambs. The value of the ewes has been calculated at £3 because similar ewes, from the same flock, were sold by auction as culls, last August, at this figure. It will be noted that these ewes appreciated by more than £2 per head by sale time. We would suggest that if Suffolk cross, cull ewes (sound in the udder) can be bought at around the £3 mark in future seasons, a final 'catch crop' of lambs might yield a useful profit under this sort of management and given similar realization prices for both ewes and lambs.

The authors offer their grateful thanks to Lord John Manners (Belvoir Grass Drying Co. Ltd.) and his farm manager, Mr. R. J. Wilbraham, for the facilities made available for this observation study and for their interested co-operation throughout. They are also greatly indebted to Dr. Ian Gordon, of University College, Dublin, for considerable technical advice on lambing synchronization; to Messrs. G. D. Searle and Co. Ltd. for the provision of 'Syncro-Mate' pessaries; to Boots Pure Drug Co. Ltd. for freeze-dried pregnant mare serum; and to Messrs. L. E. Pritchitt and Co. Ltd. who supplied the 'Ewelac' milk substitute.

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The National Wheat Survey

B. G. Jackson and F. G. Sturrock

For many years agricultural economists at the universities have carried out costing surveys of crops and livestock. The results have been useful in many ways. In addition to showing the structure of costs, they have provided the raw material for gross margins and other standards that can be used for planning and measuring farm efficiency.

Sample surveys

In the past, Farm Economics Departments have usually been content to survey their own areas and to obtain data from farmers known to be willing co-operators. To begin with no other course was possible because only a few farmers were willing or able to provide the information necessary. For this reason costing surveys have been criticized on the grounds that there was no guarantee that the sample chosen was representative. Indeed, it has been suggested that groups of willing co-operators might include an unduly high proportion of efficient farmers who kept good records. In practice, the agricultural economists have always tried to assemble samples that were reasonably representative. Nonetheless, there was no means of knowing how far they had succeeded. There was a further criticism—that the results were drawn from one part of the country and could not be used with confidence elsewhere.

There was only one way of silencing these criticisms and that was to carry out a national survey based on a random sample. To be successful, however, it was essential to obtain a reasonably high response rate. Thirty years ago it is doubtful whether more than one farmer in five would have been willing or able to co-operate. Now the position has quite changed. More farmers have good records and, of even more importance, far more farmers are keen and interested in the results obtained. The time seemed ripe, therefore, for the launching of a survey based on sound statistical methods. To test the response rate, a pilot random sample of potato growers was costed from Cambridge in 1963. As the response rate was about 90 per cent, a project for a national sample appeared feasible. The crop chosen

was wheat harvested in 1964 and all the university agricultural economics departments agreed to co-operate.* The information was assembled at Cambridge.

To select the sample, holdings growing wheat in 1963 were grouped into five size strata, according to the acreage of wheat grown (see Table 1). Small growers are numerically important but the bulk of the wheat acreage is accounted for by large units. For this reason the sampling fractions were higher for the large acreages, and in fact overall the probability of a grower being selected was proportional to his wheat acreage. The accuracy of any particular estimate, such as the gross margin per acre, depends of course on the variability of the item between different farms, and the sample size of about 300 farms was chosen with these considerations in mind. The merit of a random sample is not that the results are perfectly accurate but that the degree of accuracy of the estimates can be calculated.

Response

Not all the 307 farmers in the first sample took part. A few grew no wheat in 1964, or had left the holding. A few were unwilling to co-operate. Some of these were replaced, and finally completed records were obtained from 283 farmers, representing a response rate from potential co-operators of just over 90 per cent. The location of these farms is shown on the map on page 311, and the number in each university 'province' is given in Table 1. Province boundaries are also shown on the map.

TABLE 1

Distribution of wheat sample farms by university provinces

Wheat acreage size group	*Number of farms*									
	Bristol	Cambridge	Exeter	Leeds	Manchester	Newcastle	Nottingham	Reading	Wye	Total
½— 9½	4	5	0	2	3	—	—	1	—	15
10— 29½	6	21	2	8	6	2	7	5	5	62
30— 69½	12	23	1	5	7	1	14	8	6	77
70—299½	12	53	1	5	3	2	20	11	6	113
300 and over	—	8	—	—	—	—	5	1	2	16
Total	34	110	4	20	19	5	46	26	19	283
Per cent	12·0	39·0	1·4	7·0	6·7	1·8	16·2	9·2	6·7	100·0

Costs and returns

The survey results were analysed on the Orion computer at the Rothamsted Experimental Station. The data from each farm was coded and transferred to punched cards, using a fixed layout. These provided the input for transferring the data to magnetic tape. Cost structures have been calculated, using a special programme written for the Orion. These results are summarized in average form in Table 2, where Exeter province is combined with Bristol, and Newcastle with Leeds.

*The survey was under the direction of a sub-committee of the Conference of Provincial Agricultural Economists, consisting of representatives from the Universities of Bristol, Cambridge, Nottingham and Reading, and was organized from Cambridge. The views expressed in this article are those of the authors, and are not necessarily those of the sub-committee.

TABLE 2

National average costs and returns from wheat—1964

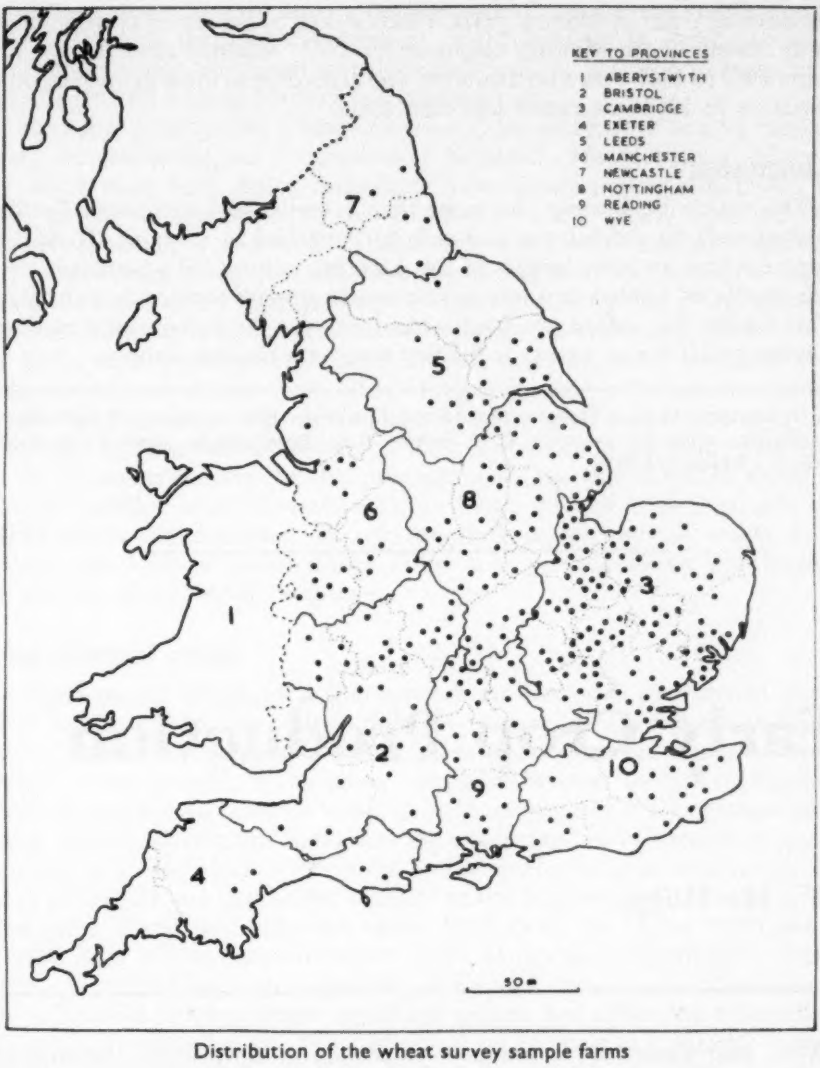
(£ per acre)

Province	East				West			Average
	Cambridge	Leeds and Newcastle	Wye	Nottingham	Reading	Bristol and Exeter	Manchester	
Yield (cwt)	36·4	35·8	29·2	36·4	32·2	34·8	35·0	35·2
Seed	3·1	2·8	3·4	3·0	2·8	3·1	3·9	3·1
Fertilizer	3·1	3·4	3·9	3·3	3·7	3·8	3·6	3·5
Sprays	0·7	0·4	0·5	0·7	0·4	0·4	0·5	0·6
Miscellaneous ..	0·5	0·8	0·4	0·5	0·6	0·8	0·8	0·6
Variable costs ..	7·4	7·4	8·2	7·5	7·5	8·1	8·8	7·8
Labour	2·4	2·4	2·2	2·3	1·8	2·7	2·8	2·4
Machinery	6·7	6·3	6·6	6·1	6·2	6·9	7·5	6·6
Rent	6·7	4·3	5·6	4·7	4·2	4·7	5·4	5·5
Storage	1·4	1·1	1·8	1·6	1·6	1·6	0·5	1·4
Overheads	3·7	3·2	3·7	3·3	3·2	3·6	3·8	3·6
Fixed costs ..	20·9	17·3	19·9	18·0	17·0	19·5	20·0	19·5
Total costs	28·3	24·7	28·1	25·5	24·5	27·6	28·8	27·3
Grain sales ..	47·2	46·3	38·6	46·0	43·1	44·8	44·0	45·4
Gross margin ..	39·8	38·9	30·4	38·5	35·6	36·7	35·2	37·6
Net margin	18·9	21·6	10·5	20·5	18·6	17·2	15·2	18·1
Value of straw* ..	2·6	3·2	2·8	1·9	1·9	2·8	3·2	2·6

*Not included in gross or net margins

Variable costs such as seeds, fertilizers and sprays vary directly with the wheat acreage. It will be seen that these items average about £7 10*s.* per acre and are remarkably uniform. Fixed or common costs, such as regular labour, machinery, storage, rent and overheads, are also reasonably uniform. Machinery costs in the Manchester area are rather higher than elsewhere, mainly because the farmers spend more on contract cultivations. Labour requirements can be calculated approximately from the cost shown. At an average payment of just under 5*s.* per hour (allowing for some women and young workers) it is evident that on average about 10 hours per acre are required. Rental charges shown are actual, or in the case of owner-occupiers, an estimate of the local market rate. The high rent charge for the Cambridge province is largely due to the inclusion of fen soils around the Wash, which carry heavy drainage rates in addition to a large rent. General overheads which cover items such as insurance and office expenses are represented by an arbitrary addition of 15 per cent. A check made recently at Cambridge, using data from the Farm Management Survey, confirmed that 15 per cent is the most reasonable average figure for this purpose. The gross margins shown are calculated as the difference between grain sales and variable costs. Straw was sometimes sold, but was usually retained on the farm to be used as bedding or to be ploughed in or burnt. Because the valuation of straw is often difficult to ascertain, it was decided to exclude it from the gross and net margins.

One interesting feature of the figures in Table 2 is the similarity between provinces. This result is at first sight a little surprising. As can be seen from the map, wheat growing is much more popular in the east than in the west. It might be surmised, therefore, that wheat was substantially more profitable in the eastern half of the country. In fact, the eastern provinces do show gross margins of about £3 or £4 per acre more than in the west. Wye



Distribution of the wheat survey sample farms

province, however, which includes wheat on some poor Weald clay, is an exception. This difference is appreciable but by itself is hardly great enough to explain the marked concentration of the crop in the east. Indeed, at first glance it might be considered that farmers in the west could with advantage grow more wheat. This probably is too facile a conclusion. Wheat in the west is presumably confined to limited areas suited to the crop, whereas in the east wheat can be grown successfully almost anywhere. A further limitation on wheat growing in the west is the higher rainfall which presumably hampers cultivation and harvest. This is a handicap that does not necessarily show itself in the form of increased costs on the crops that are grown successfully. Another possible reason for the similarity between east and west is that in 1964 the weather was unusually favourable for the cereal harvest. In a wetter year yield differences, for example, might have been greater. This argument can be tested by comparing the regional

variation in yields in different years. Yields shown by the survey corresponded quite closely to the Ministry estimates for 1964. Ministry estimates for the years 1959 to 1962 were also available, and according to these figures regional variation in 1964 was rather less than usual.

Conclusion

This article is, however, no more than a preliminary comment. Further analysis will be carried out and will be published in a report. It will be apparent that an investigation of this kind has substantial advantages over the results of limited and less representative surveys previously published. This scheme has indeed provided a blue print for the current milk costings scheme which is also based for the first time on a random sample.

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Early Crop Production

W. H. Hogg

EVERY year since 1957 a one-day symposium in agricultural meteorology has been organized by Mr. J. A. Taylor of the Department of Geography, University College of Wales, Aberystwyth. On 9th March, 1966, Symposium IX, on Early Crop Production in the British Isles, was held at the Welsh Plant Breeding Station and fourteen papers were presented and discussed.

Horticultural crops

With horticultural crops there are clearly very good economic reasons for exploiting natural climatic and topographic advantages in order to reach the market before competitors. Early potatoes were therefore discussed by many contributors. Climatic factors, both macroclimatic and mesoclimatic,* are favourable for early production in the south and west,

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**Macroclimate* is the general climate of a substantial area down to about the size of a county. *Mesoclimate* (sometimes known as local climate) is concerned with the climate of smaller areas, say down to the size of towns, parishes and farms.

and there seems little to choose between west Cornwall and the Pembroke coast. Possibly the later development of the industry in Pembroke is an advantage which, combined with labour difficulties, will lead to more large producers and a more efficient use of machinery.

Earliness is, of course, a relative term and the presence of nearby markets may be important, as in south-west Scotland. Macroclimatic influence is less evident here, but a favourable mesoclimate largely determined by topography is important, as also is the use of the variety Epicure. This variety grows early and rapidly, bulks well, and devotes a large proportion of its dry weight and carbo-hydrate production to tuber formation. As it also recovers rapidly from frosting, it is not surprising that it has survived efforts to replace it on the grounds of its rather low culinary quality.

With early potatoes, the main aim of any farmer is earliness and, because of competition from other areas, it is often economic to sacrifice yield to achieve this. This is true also of some other crops such as spring cabbage, narcissus and strawberries. Very early areas in the south-west have a six-month monopoly in the production of the out-of-season crops of winter cauliflower and anemones. With these, the aim is to maximize the yield and continue production over the whole season because, unlike early crops, the price of out-of-season crops does not necessarily fall—indeed it may rise as the season progresses.

Agricultural crops

Other papers presented at the symposium dealt with agricultural crops, and for these there are entirely different reasons for striving for earliness. With cereals, for example, breeding for earliness is carried out in order to avoid a late harvest, which causes labour difficulties in eastern England and which may also lead to losses in yield and quality if the weather worsens. The use of combine harvesters has encouraged early harvests to lessen the risk of a crop which is too moist. In marginal areas it is, however, necessary to exploit any favourable districts at the beginning of the season and the rather higher soil temperatures in April along the Moray Firth and in Easter Ross lead to increased barley yields. In this part of Scotland a 10-day delay in drilling leads to a decrease of about 3 cwt in yield. The concept of earliness is also important in herbage grasses, and efforts are being made to extend the growing season by investigating earliness as a varietal characteristic. It is clear that any increase in earliness will reduce the period of dependence on conserved or purchased foodstuffs.

Conclusion

The convenor of this symposium is to be congratulated on bringing together so many people who are interested in earliness from different standpoints. As a result, there were stimulating discussions and the collection of papers will form an invaluable permanent reference on the subject.

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Coxes at Fernhurst

A Profitable Past — a Promising Future?

(1)

The first of two articles by

R. O. Cobham J. F. Crozier G. D. Lockie

MANY Cox growers today are uneasy about the financial prospects facing their orchards. Their uneasiness results partially from the inevitable uncertainties of the weather and trading policies. However, to a larger extent it stems from near-certainty about a number of factors: the capital costs of orchard establishment, growers' operating costs, and competition in the U.K. dessert apple market will all increase in the future.

Increasing competition

The likelihood of increased competition is indicated by the trends of supply and demand facing the home apple producer. Between 1951 and 1960 the dessert apple orchard increased by some 6½ per cent (4,000 acres —mostly Cox), and this was accompanied over the same period by a substantial increase in physical output. Since a high proportion of the national dessert apple orchard is not yet established, it must be expected that productivity will continue to increase as the young trees reach full bearing. Coupled with this increase in home production there have been substantial plantings of dessert apples in the countries which export to us, particularly in the best growing areas of France and Italy.

When these activities are related to an increase of only about 4 lb per head (28 per cent) in the U.K. consumption of dessert apples between 1956 and 1961, it is clear that, relative to money values and unit cost changes, there will be no significant increase in prices. However, against this, the

Picking in progress at Fernhurst

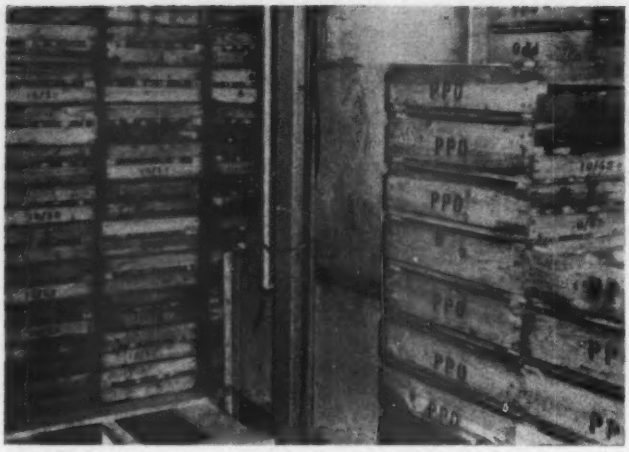
nationally-grown Cox has certain distinct characteristics which the increasingly discriminating consumer associates with a convenience food of quality: the type of food for which there is likely to be a growing demand as income levels rise. Even the Cox, though, could fall from favour if the maintenance of quality is not coupled with selling prices that are directly competitive to the imported Golden Delicious.

The Fernhurst story

In view of this rather forbidding prospect of a tougher economic climate, it is hoped that growers will find considerable reassurance in the results of the Fernhurst orchard which have been widely publicized in recent months. Since the Open Day held by Plant Protection Limited in July, 1965, growers have been asking two main questions: firstly, 'What have been the chief factors responsible for the success at Fernhurst and what is their significance in relation to other orchards?' and secondly, 'What guidance can the Fernhurst results give for the future?' The prime aim in the two articles is to try to answer these very questions, having first refreshed the reader's mind with a summary of the Fernhurst story.

General policy

In 1946, 26½ acres of Coxes were planted as part of a 68-acre mixed orchard. The aim was to grow trees of a manageable size which would fill the tree space quickly and provide a large area of fruiting wood. To this end the Coxes were grown on Malling II and allowed to grow quickly to a height of 15 feet, the delayed-open-centre method of pruning being used. In 1953 a refrigerated storage building with grading facilities was erected and this made it possible to market the Coxes during the period up to the end of March. Throughout the whole life of the orchard, marketing has been carried out independently through normal channels, namely, the London wholesale market.



Fruit in the store—illustrating storage for most advantageous marketing

The results

The extent to which this general policy has been successful is shown by the financial results of the orchard, which have been recorded since 1946 and are summarized in Table 1.*

TABLE 1

Annual average performance per acre—Coxes

	Average 1946–64	Average 1960–64
	£	£
Gross receipts	539	999
Total variable production costs	27	47
Gross margin (ex orchard)	512	952
Total variable marketing costs	128	260
Gross margin (at point of sale)	384	692
Total common costs	135	245
Orchard profit	249	447

The most important criterion of an orchard's performance is the percentage return on capital which is earned. At Fernhurst the average levels of capital investment per acre have been high. However, these levels have been fully justified, as is evidenced by the figures shown in Table 2.

TABLE 2

The average returns to capital investment

	Average 1946–64	Average 1959–64
Fixed and working capital investment (£/acre)	538	845
Return on capital (%)	46·5	53

*For full details see *Fernhurst Orchard—A Profitable Investment in Dessert Apples*, published by Plant Protection Limited.

Reasons for profitability

What then have been the main factors responsible for this performance, which has been high by even above-average standards?*

The first reason is that good management in the fields of production and marketing has produced high gross receipts per acre. Gross receipts are the product of yield and price. Both of these have been high at Fernhurst. The yields which were obtained are shown in Table 3.

TABLE 3

Annual yields per acre

Year	Yield (Bushels/acre)	Year	Yield (Bushels/acre)	Year	Yield (Bushels/acre)
1948	1	1954	256	1960	482
1949	2	1955	263	1961	267
1950	39	1956	259	1962	651
1951	35	1957	452	1963	620
1952	74	1958	452	1964	811
1953	108	1959	603	Av.	283

The experience at Fernhurst shows that intensive spray and fertilizer programmes can be thoroughly justified on economic grounds. The variable production costs, i.e., sprays, fertilizers, etc., represent a relatively small (about 10 per cent) proportion of total costs. Yet the full and proper use of fertilizers and sprays can increase yields considerably and economies in their usage are both penny and pound foolish.

High yields can help to reduce the cost of establishing an orchard. At Fernhurst, the Coxes were established at a net cost of £965 per acre, compared with a figure of £1,227 per acre for the mixed orchard as a whole. The lower net establishment cost for the Coxes was due to the high yields obtained. For the grower with limited cash resources, who is considering what area he should plant, this is an important point to bear in mind.

The investment in storage facilities at Fernhurst has enabled the marketing of fruit to be concentrated in the high price, post-Christmas period. The figures in Table 4 illustrate the influence of the time of marketing on the average prices of the Coxes over the period 1956–1964.

TABLE 4

Average prices per bushel

that would have been received had the Fernhurst Coxes been marketed during			*actually received at Fernhurst throughout the whole season*
October	*Oct-Dec*	*Jan-March*	
25*s.* 8*d.*	34*s.* 7*d.*	47*s.* 11*d.*	43*s.* 2*d.*

NOTE: The average price received at Fernhurst is in no way artificial. It represents an average of the *wholesale* prices which have been received, these being the ruling market prices for the grades in question at the particular times of marketing. None of the fruit has been sold retail at a higher price.

*For comparison with the performances of other orchards, see *British Fruit Farming—An Economic Study of the Production and Marketing of Apples and Pears*, by R. R. W. Folley and W. L. Hinton, University of Cambridge, Farm Economics Branch, Report No. 64.

From the records of yields and prices it has been possible to calculate the additional profits obtained from marketing throughout the season, as opposed to marketing in the October-December period. When these additional profits are related to the capital invested in storage, grading and marketing facilities, it is estimated that this investment has produced the profitable rate of return of 34 per cent.

The high price obtained for Coxes also reflects the high quality of the apples produced. This in turn is a reflection of the high standard of management and of the full use of sprays. In recent years wage rates have increased faster than any other single cost item. At Fernhurst the application of work study techniques to establish good work routines has played a significant part in holding down costs as far as possible.

Summary

In short, the factors which have brought success at Fernhurst are:

(i) *High yields*—location and policy; tree type and pruning; sprays and fertilizers, etc.

(ii) *High prices*—quality; storage; grading, etc.

(iii) *Efficient labour use*—good work methods.

The experience at Fernhurst has shown that a high level of technical management, imposed on a sound basic plan, can produce very good profits at a time when other orchards are struggling (see R. R. W. Folley and W. L. Hinton op. cit.). Given that the economic climate for apple growers may well be even tougher in the future than it is today, it is important that growers should, as far as possible, take the right decisions now in planning their future policy. Thus the second article will be devoted to outlining the factors which need to be considered in planning future orchard policy and, in particular, to discussing the guidelines which emerge from the Fernhurst results.

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G. D. Lockie, N.D.H., is Estate Manager at Fernhurst Research Station and has been responsible for the original planning and continuing development of horticulture at the Station. He is especially interested in technical and management development, including the use of work study in vegetable, glasshouse and fruit growing.

The Re-organization of Farm Layout

An example from North Pembrokeshire

Jessie P. Morgan

At Longhouse Farm in Pembrokeshire, Mr. Peter J. Perkins has built up a business on 452 acres of clean land (and 70 acres of cliffs, islands and other waste) which before the second world war was divided among thirteen different occupiers. In the course of this operation he has amalgamated two former holdings, consisting of eighteen enclosures, into a single field of 35 acres, and another complete holding of eleven enclosures into one field of 29 acres, apart from other less spectacular field boundary adjustments. His work has shown his neighbours how the amalgamation of small, awkwardly-shaped enclosures into rectangular fields of up to 35 acres can facilitate mechanized crop production while leaving adequate control over grazing livestock. Many have called upon his services as an agricultural contractor to carry out similar work for them.

The farm and its neighbours

Longhouse is situated on the north-west coast of Pembrokeshire, about halfway between Fishguard and St. Davids. Lying at an altitude of between 100 and 250 feet above sea level, from the cliff-tops to a distance of just over a mile inland, its shallow, brashy soils warm up rapidly in spring and are very rarely affected by late frosts, though the more exposed fields suffer a little from salt spray. Mr. Perkins's cropping programme includes 150 acres of early potatoes, 150 acres of spring corn and a small acreage of early bulb flowers.

Before the war Longhouse, at that time owned and occupied by Mr. Perkins's grandfather, amounted to 227 acres of clean land, which was its size when Mr. Perkins himself took it over in 1947. Adjoining its southern boundary were a considerable number of holdings of about 15–30 acres each.

Livestock rearing and fattening were then the dominant enterprises in this area on large and small farms alike, with corn and root crops being grown to feed the animals in winter, and potatoes only for farmhouse consumption. The occupiers of the smaller holdings followed what, in fact, amounted to a system of subsistence farming—producing their own milk, butter, eggs, pig and poultry meat, potatoes and garden vegetables, and obtaining the cash for their rent (if tenants) and other requirements from the annual sale of a few two-year-old cattle and lambs. Mr. Perkins estimated that the total annual cash receipts of an occupier of 25–30 acres, at the prices ruling in the late 1940s and early 1950s, amounted to about £200 gross, from which a tenant farmer having his cultivations done and corn cut by contract (as some did) might pay £120 a year in rent and contractors' charges.

Most of these small farmers were elderly men whose sons, having left the area or taken other jobs during and after the war, were not interested in keeping the family farm and either existing on this kind of income or trying to run the holding in conjunction with a full-time job. From 1949 onwards holdings adjoining Longhouse came upon the market one by one, and Mr. Perkins was able to buy them, often being the only serious bidder.

Improvements commence

In contrast to the original Longhouse fields, those of the holdings which Mr. Perkins subsequently acquired were 1½–5 acre paddocks, satisfactory for small-scale livestock rearing (although most of the hedges were no longer stockproof) but not for efficient cultivation with modern machinery. Most of the field boundaries were earth-filled, stone-faced banks, and even those on Longhouse caused trouble because stones kept falling out and interfered with machinery on the headlands if not picked up. Taking stock of the situation, Mr. Perkins decided he had sufficient work to justify the purchase of special machinery, particularly as other people would probably want to remove hedgebanks as well, and in 1950 he bought an ordinary flat-bladed bulldozer. In 1954 he commenced the first part of what has amounted, with further work in 1958 and 1959, to his biggest improvement—the creation of the two fields of 29 acres and 35 acres previously mentioned. This operation involved the demolition of 5,000 yards of hedgebank and two houses, together with outbuildings, yards and approach lanes to these and to two other houses left standing as storage buildings. When the farm was visited at the beginning of April this year, no trace of the former banks and other structures could be seen, either by differences in the nature of the land or in the growth of crops (which were then just showing) and temporary grass.

Mr. Perkins has naturally improved his techniques since he first started this kind of work. In 1958 he removed 2,500 yards of bank using the flat-bladed bulldozer he first purchased. This necessitated two men hand-picking stones for twenty days, and in addition a tractor and cultivator were employed for eight days trying to bring up stones and roots lying just below the surface. The total cost came to 4*s.* 6*d.* per yard at 1958 wages and prices. Mr. Perkins subsequently bought two Drott-skid shovels and a hydraulically-operated scarifier, which is mounted behind one of the shovels and can forcibly penetrate the ground to a depth of two feet to bring up stones and roots. Using this equipment he can quote 5*s.* 6*d.* to 6*s.* per yard for removal of a hedgebank and complete the job quickly and thoroughly, with little or no hand labour.

Some of the old hedges on Longhouse (including a length of boundary bank) have been replaced by mass-concrete walling, laid *in situ* between shuttering on concrete foundations, with upturned stones providing a key between foundation and wall. The walls provide more shelter from salt spray than fences, and require both less land and less maintenance than the old banks. Any kinks in the old boundaries were straightened out and narrow gateways were widened at the same time. Some gates have been replaced by cattle grids, including five on the main track from the farmstead to the top land. The route crosses a county road and the gates could not be left open between journeys with stock on some fields. After Mr. Perkins discovered that it took an average of one minute to deal with each gate on each journey, amounting to forty minutes on the single operation of carrying four loads of manure to the top land, the gates did not survive for very long.

Adding to acreage and employment

Mr. Perkins undertook the improvement of his field layout mainly so that he could include the additional land he had purchased in his normal rotation without wasting the time of his men and machinery. He has also found, however, that he has added significantly to his effective acreage. By removing 5,500 yards of hedgebank four yards wide at the base, he has also eliminated 55,000 square yards of headland (5 yards on either side) previously yielding only half a crop. This is the equivalent of just over 10 acres (out of the 64 acres of croppable land in these two fields), obtained at a total cost before grant of approximately £135 per acre.

Between Longhouse, another farm of 206 acres he has recently acquired some distance away, and his business as an agricultural contractor, Mr. Perkins regularly employs 15 or 16 men. Including himself, therefore, his business provides a livelihood for 16 or 17 men and their families. He says he could not employ so many men and machines were it not for his contractor's business, but having them enables him to complete his own work very quickly and to tackle easily jobs which would be beyond the reach of many farmers. For example, in addition to the improvements already mentioned, he has constructed two reservoirs to provide irrigation for his early potato crop.

The author of this article, **Jessie P. Morgan, B.Sc., M. S. Agric. Econ.**, is a Research Officer in the Agricultural Land Service. She gained her Agricultural Economics degree at Michigan State University while holding one of the Ministry's Kellogg Foundation Fellowships.

Water Storage for Irrigation

K. H. Lambert

ALTHOUGH several hundred farm reservoirs for irrigation have been constructed in England and Wales, there has been a lull in this activity during the past year or so due to the licensing system which the River Authorities have had to set up under the Water Resources Act of 1963. It must be some considerable time before any major projects are undertaken which could include the supply of irrigation water on an area basis. Indeed some preliminary studies have shown that distribution costs for such projects may make them unattractive except perhaps to riparian owners and except for crops with a very high return. It is, therefore, likely that farm storage will continue to play an important part in irrigation.

Careful planning required

Such storage usually involves capital expenditure of at least several hundred pounds per million gallons and it is important that each proposal should be carefully considered before deciding to go ahead. It must also be remembered that the work, once carried out, will be expected to last for a long time. It is, therefore, essential that the supply of water be assured, that the reservoir should be of the correct size and that the standard of construction should be such as to ensure long life without excessive maintenance costs. The initial cost is not the only cost involved.

In the near future the Ministry will publish Bulletin No. 202, *Water for Irrigation*. This will give guidance on possible sources of water and on the design and construction of reservoirs on a farm scale, with embankments not exceeding 15 ft in height. Reservoirs with a capacity exceeding five million gallons must, of course, be designed by, and constructed under the supervision of, a qualified civil engineer from the appropriate panel constituted under the Reservoirs (Safety Provisions) Act of 1930.

Before the engineering considerations can rationally begin, the agricultural objective needs to be defined. An estimate can then be made of the amount of water needed to irrigate the crop acreages on the lines indicated in Bulletin No. 138, *Irrigation*. The amount of water required will dominate all other considerations.

The poorly-sited spillway referred to below

Impounding reservoirs

To most people the term 'reservoir' suggests one which is formed by constructing a dam across a stream. Such reservoirs, known as impounding reservoirs, have only a limited application for irrigation water supply in this country. This is due to the difficulty of location, geological conditions, catchment characteristics, and other factors. It is not always realized that the flow from any particular stream catchment can vary enormously and that the maximum flow which may be experienced will be many times the normal flow. This maximum flow will occur only infrequently, but an impounding reservoir must be equipped with adequate overflow capacity to cope with it. The Reservoirs (Safety Provisions) Act of 1930 owes its inception to the disastrous failure of two dams, one of which had a catchment area of only 33 acres and a capacity of 5¼ million gallons. Impounding reservoirs have other disadvantages and they are likely to be suitable only in a comparatively small number of cases.

Guidance on overflows and spillways is given in the Bulletin. The methods suggested are not cheap. There is no inexpensive solution and disregard of the correct principles has to be paid for in one way or another. The illustration above shows a poorly-sited spillway which eroded rapidly down a steep slope, cutting a deep gulley and endangering the stability of the dam. Proper design and construction are the only safeguard.

Off-stream reservoirs

In most schemes involving farm storage, the solution will be to use an off-stream reservoir, i.e., one that is built off the line of a stream filled during the winter months by gravity or by pumping from a river or, if it is possible, by the collection of under-drainage from the land which has to be irrigated in the summer. The latter type of system, if the levels of the land and the soil type are suitable, may be the most economical solution. For instance, in a particular scheme in Sussex an area of Weald Clay is fully under-drained and the tile outfalls are led to two reservoirs each of 4½ million gallons to provide irrigation water for 106 acres of top fruit. It is estimated that the water available will be sufficient in nine years out of ten. In another case the tile drainage from 600 acres is led by ditches to the lowest point in the farm, where a 23-million-gallon reservoir has been constructed in an area

which is too low to be drained by gravity. The water is fed back into the ditches in the summer for distribution by a portable system. There is no doubt that this principle of collecting drainage water can be extended to many other situations.

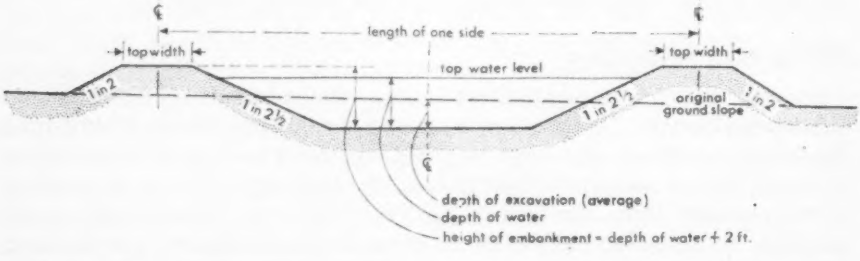
Typical sizes of off-stream reservoirs

(assumed square)

Reservoir capacity	Depth of water	Length of one side	Depth of excavation	Top width
(million gallons)	*(feet)*	*(feet)*	*(feet)*	*(feet)*
½	6	150	3¾	9
1	8	185	4½	10
2	10	225	5¼	10
3	10	270	4½	10
4	12	295	5¾	11
5	12	320	5¼	11

Earthworks

Whatever type of reservoir is adopted, the standard of earthwork is particularly important, especially as regards embankments. It is false economy, and in fact dangerous, to adopt steep slopes which may appear to save land but are difficult to construct and impossible to maintain in a satisfactory condition. For embankments not exceeding 15 ft in height, the slope of the wet face should not be steeper than one vertical to two-and-a-half horizontal, but some soils may require flatter slopes. The slope of the dry face should be not steeper than one to two, but if surplus soil is available it should be made as flat as possible, giving the advantages of easier construction and easier maintenance and perhaps enabling the back slope to be put to some agricultural use. The construction of the earthworks should be entrusted to a contractor with experience of this type of work as the techniques of proper placing and of proper consolidation of the soil require skill. The use of the wrong machines or attempts to carry out the work under unsuitable conditions can easily produce unsatisfactory results. The real effect may not be apparent until excessive settlement, shrinkage and perhaps slipping of the banks occur some time afterwards.



The most economical design for an offstream reservoir is one where no more material is to be excavated than that required for building the embankments. The drawing and table on this page give dimensions for such reservoirs with capacities of a half to five million gallons, square in plan, constructed in evenly sloping ground and with water depths of between 6 and 12 feet.

This is, of course, only a rough guide as in practice ground levels vary considerably and the plan shape will be dictated by topography and in some cases by the land which can be made available.

Suitable soils

The question of suitable soils will be dealt with at length in Bulletin 202, which will also give guidance upon the various types of embankment construction which are appropriate. Homogeneous construction, i.e., built of one type of soil, is likely to be the cheapest but this is only possible when the soil is well graded with a clay content of twenty to thirty per cent. If only a limited amount of such impermeable soil is available a 'core' construction may have to be used with permeable soil surrounding a core of impermeable soil. If no impermeable soil is available at all, it may be necessary to use some form of waterproofing, provided, of course, that the high cost of such a reservoir is economic in relation to the irrigation benefits expected.

It is generally preferable to try to find a site where impermeable soil is available as waterproofing measures are extremely expensive, but cases do arise where there is no alternative. Only a small number of reservoirs have been artificially waterproofed so far. For most of these sheet lining methods have been used, although soil treatment or cut-off methods may provide a satisfactory solution in suitable circumstances. Where a sheet lining method is used, even greater care must be taken with the earthworks as settlement may cause the lining to be subjected to excessive strain. This can result in leakages which are difficult and expensive to locate.

The cheapest form of lining is flexible P.V.C. not less than 0·014 inches thick. As this tends to harden when exposed to sunlight, it must be covered with soil at least 12 inches in thickness, but in order that the soil may stay in place over the P.V.C. it is necessary to flatten the slope to 1 in 4 or even flatter when wave action is expected. The lining on the bottom of the reservoir need not be covered by soil, provided at least 12 inches of water remain on it. The effective life of this material under such conditions has not yet been fully established and careful maintenance is necessary. Butyl rubber, a synthetic material 0·030 inches thick, is now available and although more expensive it has definite advantages. These include high strength and resistance to ageing so that earth covering is not required. Reinforced bituminous sheeting of half an inch thickness has also been used with good results and a life of 20 years is claimed. In all cases it is advisable to employ a specialist contractor.

Conclusion

I have given above only a few of the points which can arise in the construction of water storage for irrigation. There are many others which must be studied and it is hoped that the forthcoming Bulletin will be of help to those who have such a project in mind.

K. H. Lambert, B.Sc., M.I.C.E., A.M.I.W.E., has been a Senior Engineer in the Ministry's Land Drainage, Water Supply and Machinery Division at Headquarters since 1963. He was previously Regional Engineer at Tunbridge Wells.

The Proof of the Vacuum Silage Pudding

R. Bee

THE method of making silage under vacuum aroused great interest when introduced from New Zealand into this country last year. Various claims were put forward particularly that (*a*) less losses were involved using this method and therefore (*b*) a better feed material would result. Many farmers made vacuum silage with little or no visible waste but there were also some disappointments. Nutrition chemists report no significant difference between vacuum silage and that made by conventional methods in the actual fermentation process within the silage. Strictly comparable experiments have shown no real differences in the main source of loss, i.e., fermentation or invisible loss. What about the feed value of vacuum silage? Again, a number of farmers state that they have had good results in feeding this silage. However, the value of silage as a feed is largely determined by the condition of the herbage when ensiled, and there have been few direct feeding comparisons of the same herbage made under both vacuum and conventional methods. One of these was conducted at Drayton Experimental Husbandry Farm last winter.

The material

Second-year perennial ryegrass/white-clover mixture receiving 2½ cwt per acre of sulphate of ammonia in early March was cut on 25th May and wilted. On the following day frequent showers occurred and the filling of a vacuum 'silo' and conventional silo commenced on 27th May and was completed in two days. On the 29th May the same herbage was made under vacuum in a third silo and on the following day again the same material

was placed in a fourth silo and evacuated. The weather continued dry. The material which went into silos 3 and 4 had lain longer in the field, and was therefore drier than that which went into the first two. Silo 1 (vacuum) and silo 2 (conventional) were, however, strictly comparable as alternate loads were weighed and sampled into each.

The cattle and the eating

Fifty-three spring-born Hereford × Friesian steer calves, which had been intensively reared at grass from 10 weeks old, entered the cattle yards on 5th October, 1965, and 40 uniform animals were drawn out to form two matched groups each of 20. Both groups of cattle received 2 lb per head per day of rolled oats plus beans throughout. They were gradually introduced to *ad lib.* feeding of silage, using silage made last in the fourth silo for a five week run-in period. With *ad lib.* feeding, animals were fed 10 per cent extra silage above their daily intake, to ensure ample supply without undue selection by the cattle. All the silage offered and refused was weighed daily with each group. Daily samples showed the following representative analysis.

TABLE 1

SILO 4

DM 37·0%	:	pH 4·7
Crude protein in DM		10·4%
Crude fibre in DM		31·2%
Sugar in DM		7·6%
Lactic acid in juice		22·5 mg/ml

During the last three weeks of the five-week introductory period, when the cattle had attained full *ad lib.* feeding of this silage, both groups were making an average daily liveweight gain of 2 lb per head. The beasts finished the introductory period and commenced the feeding trial direct comparison, one group receiving vacuum silage (silo 1) and the other conventional silage (silo 2) on 9th November at an average weight of 465 lb in both groups.

Feeding trial results

TABLE 2

	Vacuum compressed	Conventional wilted
	(lb/head/day)	
Food consumption		
Fresh material		
Silage	41·9	41·9
Corn (rolled oats plus beans)	2·0	2·0
Dry matter		
Silage	9·00	8·78
Corn	1·70	1·70
*Liveweight gain**	0·99	0·80

*The difference in liveweight gain between the two groups is not statistically significant (P=0·05)

After finishing the comparative feeding trial both groups received silage from silo 3 during a 5-week run-out period. The cattle gained 1·59 lb per head per day. In the last fortnight of this period they gained 1·80 lb per day and ate 45·7 lb of silage per head (14·3 lb DM) plus 2 lb of rolled oats.

TABLE 3

ANALYSES

	Silo 1 Vacuum compressed in polythene	*Silo 2* Conventional wilted	*Silo 3* Vacuum compressed in butyl rubber (0·020 in.)
Dry matter (%)	22·0	21·2	29·3
pH	4·2	4·3	4·8
Crude protein in the DM (%)			
Wet	11·5	12·7	10·9
Dry	12·1	12·2	11·2
Crude fibre in the DM (%)	31·4	29·4	29·4
Sugar in the DM (%)	6·6	1·6*	6·0
Acids in the juice (mg/ml)			
Lactic	19·4	20·9	18·7
Acetic	4·8	5·8	5·8
Butyric	1·4	2·5	6·0
Propionic	1·2	nil	0·6
Valeric	nil	0·6	1·0

*This atypical figure is probably due to sampling or analytical error

Vacuum silage was obviously no more acceptable than conventional silage as fresh weight total intake was the same for both groups. At first glance there appears a distinct advantage in performance due to vacuum. However, when the high proportion of total food intake required for maintenance is taken into account, the difference in live weight is only a small proportion and some of this would be due to the slight increase in dry matter intake (see analyses in Table 3).

There is ample evidence nowadays to show that the higher the dry matter of the fodder being fed (assuming the same basic herbage) the greater the intake and the better the performance. This is again supported by the much higher liveweight gain attained with the first silage fed in the run-in period (silo 4) and again in the run-out period (silo 3).

The dry matter of vacuum silage (as with any other silage) has much more effect on the performance of animals than the mere fact of evacuation. Herbage should always be wilted wherever possible to between 25 and 30 per cent dry matter to get the best results from silage, vacuum or conventional, as a feed.

It must be emphasized that this brief account is of one experiment only in one year. It merely highlights the fact that there is still a good deal not known with certainty about the making of silage and its feeding value but experience with vacuum silage may eventually give us some better understanding.

This article has been contributed by **Ralph Bee, N.D.A., N.D.D.,** who is Director of the Ministry's Drayton Experimental Husbandry Farm. After a long spell of advisory work in the West Riding of Yorkshire, he became Deputy County Advisory Officer for Cumberland, a post he held for ten years before moving to Drayton two years ago.

Research Spot

Plant Breeding at Cambridge

A. J. L. Lawrence

THE Report of the Cambridge Plant Breeding Institute for 1964–65 contains a great deal of information on breeding techniques which only a plant geneticist can appreciate. At the same time there are many points of interest to the farmer. Some are mentioned in these notes as examples of the implications for farming practice which arise from the work of the Institute.

Breeding for grain quality

Because of the low premium paid for grain quality in this country, the breeding of cereals has developed towards high yields and disease resistance rather than towards quality. High grain yield tends to be associated with low protein, so that the combination of high yield with good bread-making quality in wheat, for example, renders the plant breeder's task difficult from the start. Nevertheless, some success in this direction is shown by the winter wheat variety Maris Widgeon, bred by the Institute from Capelle Desprez and Holdfast. The grain of this variety has been consistently good in milling and bread-making quality and is regarded by some millers as being as good as that of imported Canadian wheat.

The scope for future progress in breeding for grain quality will depend on how widely such varieties as Maris Widgeon are grown. This depends on the encouragement given in the form of a premium for quality, so that farmers produce it in quantity sufficient to be worth handling by the larger milling organizations. A higher premium for grain of this variety has been offered by one of these organizations but the acreage sown in autumn 1965 was disappointing. The Report mentions that Maris Widgeon has a resistance to eyespot similar to that of Capelle Desprez, whereas all the other varieties on the N.I.A.B. Recommended List are susceptible.

A new spring wheat, Kloka, bred in Germany, has a high resistance towards mildew and may be useful in view of the likely expansion in continuous cultivation of wheat. Experiments at Boxworth Experimental Husbandry Farm have shown that a crop of spring wheat in a series of winter wheat crops is an effective way of reducing the build-up of wild oats. Kloka was added to the 1965 N.I.A.B. Recommended List and gives higher yields than Opal.

Barley

Maris Otter, a two-row winter barley, is regarded as a good replacement for Pioneer which the N.I.A.B. has now transferred to the 'becoming outclassed' category. Another new winter barley, Maris Puma, similar to Maris Otter, is better suited to spring sowing than Otter, though it gives rather heavier yields when autumn sown. It is regarded as a safer crop than Proctor sown in the autumn. It is pointed out that neither Puma nor Otter are suitable for the south-west because of their susceptibility to leaf blotch (*Rhynchosporium*). Experiments with Proctor barley have shown that the harvesting of the crop could be done earlier than is usually considered necessary for the production of a malting sample, but it is emphasized that efficient drying is essential for handling grain in this way.

Oats

A new winter oat bred by the Institute, Maris Quest, combines very short stiff straw with very high yield and is suitable for forage as well as grain. Seed of the initial release of this variety was well taken up. It is resistant to stem eelworm but susceptible to powdery mildew. Its winter hardiness is not so high as the best of the available winter varieties. Mention is made of N.A.A.S. trials over three years with high-yielding spring varieties of oats and barley in north and east Cornwall in which oats gave higher yields than barley. In some cases the yields of oats were twice those obtained from barley. This result was in part attributed to the relative freedom of oats from leaf blotch. However, when winter varieties were compared in these Cornish trials, oats were inferior to barley and more susceptible to disease.

Regional adaptation of crops in relation to disease can be dealt with by the plant breeder and the Institute's programme fully covers the leaf diseases of the major cereals. A search is being made for possible sources of resistance to wheat bulb fly.

Protein production

It is pointed out in the General Section of the Report that because of the world shortage of protein, barley grain may in future be looked on as a source of protein in addition to its role as an energy producer. The Report comments that it would be a mistake to regard it as a crop of high potential for intensive protein production; for this we must look to the field bean, of which the F1 hybrids (i.e., those resulting from the first crossing of the parent plants) appear to be the most promising. In N.I.A.B. trials five such varieties have shown considerable increases in yield ranging from 16 to as much as 30 per cent over the best commercial varieties.

Mention is also made of experiments on the potential for protein of beans harvested at different stages, in which hybrid varieties produced most protein from the seed, whereas inbred and synthetic varieties produced more of their protein in the foliage than in the seed in July. Thus it may be worth while examining the possibilities of the bean crop cut in July as a source of high protein.

Kale

Work is in progress with the production of a triple-cross hybrid marrow-stem kale similar to the double-cross variety, Maris Kestrel. A very practical

point is that seed is more easily produced in bulk from the triple-cross variety. Maris Kestrel is a short stem variety which renders it suitable for grazing with electric fencing. It is less damaged than other varieties by the selective weed-killer Semetron, now widely used for the control of fat hen and other weeds in kale. Winter hardiness is fortunately associated with a high carbo-hydrate level in the stem, which holds out the possibility of improving the winter hardiness of kale by selection.

Sugar beet

Surveys of the incidence of virus yellows of sugar beet in 1965 show that nearly 90 per cent of virus-induced yellowing in the crops examined were due to beet mild yellowing virus. This result and those of previous surveys show that BMYV is of far greater economic importance in England than beet yellows virus. The host range of BMYV include some of the most common weed species in eastern England and it seems probable that in some years at least, weeds have been important primary foci of infection in the spring.

The 1965 Report of the Plant Breeding Institute is available from Maris Lane, Trumpington, Cambridge, price 5*s.* 6*d.*

The Ministry's Publications

Since the list published in the June, 1966, issue of *Agriculture* (p. 283) the following publications have been issued.

MAJOR PUBLICATIONS

Bulletin No. 21. Domestic Preservation of Fruit and Vegetables (Revised) 6*s.* (by post 6*s.* 8*d.*)

Experimental Horticulture No. 15. June 1966 (New) 8*s.* (by post 8*s.* 7*d.*)

ADVISORY LEAFLETS

(*Price* 4*d. each—by post* 7*d.*)

No. 246. Silver Leaf Disease of Fruit Trees (Revised)
No. 368. Insects and Mites in Farm-stored Grain (Revised)

FREE ISSUES

STL No. 21. Hot-water Treatment of Narcissus Bulbs (Revised)

STL No. 54. Cold Storage of Strawberry Runners and their Use (New)

The priced publications listed above are obtainable from Government Bookshops (addresses on p. 350), or through any bookseller. Unpriced items are obtainable only from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

Spare-time Cattle Rearers

Good quality yearling cattle on spring grass at Twynrhodyn

A. W. Prowel

How difficult it is to be a spare-time farmer and still be able to follow regular employment will depend on the size of the farming business and what sort of farming is practised. Another prerequisite which seems absolutely essential is a wife who is equally interested in the farm. It is rare for regular dwellers in the countryside to remain isolated from all its activities and not make some sort of contribution to its well-being. Co-operation in farming has been much in the news during recent years. On a certain level this means, amongst other things, sharing machinery and producer marketing. There are other gaps in farming requirements on family farms. These have to be met by certain services which so often can be satisfactorily supplied only by the skilled 'local' man. A number of spare-time farmers still fortunately provide such services. I met some of these men recently—men who are as part of the land as their bigger farming neighbours. In the main, they were not ambitious to become bigger farmers, but at all costs wished to stay on the land.

To be able to farm spare time and not let this intrude between other regular employment was important to the men to whom I talked. All wanted

to enjoy their bit of farming but at the same time did not wish to become its slave. Spare-time dairy farming, with its exacting time and labour requirements, was not for them. Cattle rearing therefore appeared to be the alternative solution. The added attraction of the system was the pleasure which so many other men have also expressed in seeing animals grow and develop.

Family help

However simple the farming system, where it involves livestock there must be someone at home to feed stock in the winter and to watch over them at other times of the year. The fortunes of these spare-time farmers depend largely on the interest and enthusiasm of the wives. The men are very much aware of this and invariably the comment was that without the help of their wives it would be extremely difficult to contend with the holding and at the same time follow regular employment.

Walking around with Meirion Williams on his 8½ acres at Factory House, Pentrefelin, in the uplands of Breconshire, it was apparent how important it was to be able to have a few acres, to live out in the country and have a few head of stock. He expressed no ambitions for more acres; on the contrary, that which he had was sufficient. The demands of what was really his hobby were not great enough to clash in any way with his regular job as civilian transport driver at the nearby military camp. When he was younger Meirion Williams worked full time on the land, but after the last war changed over to his present job. Mrs. Williams's family have lived at Pentrefelin for over 100 years. Her grandfather ran the village flannel factory, producing blankets and cloth made from local-grown wool.

Whilst cattle rearing was a hobby and a pleasure, awareness of costs and returns was very naturally important; Meirion Williams knew each detail of his costs. The smallholding carries two single-suckler cows, and this year a yearling heifer for herd replacement. Replacement costs are low and on average the productive life of each cow is a very long one. In addition to the two spring-born single-suckler calves, two cross-bred calves are purchased in the autumn, and bucket fed. The four calves are usually sold at the autumn-weaned calf sales. Purchased feed costs for the bucket-reared calves were £12 a piece for milk substitute and rearing cake; creep feed for the four calves cost about 30*s*. per head, concentrates for the cows during the winter being just under £3 per head. In addition to purchased feed the only other main costs were mowing and hay baling, the bales being carried home by van.

Mr. and Mrs. Williams, who have two sons, one still at school, are more than content to live in the picturesque hamlet of Pentrefelin. Relatives and friends also farming in a small way live on the other side of the bridge over the stream. They are all local people with strong local family roots.

A living from the land

New Inn, Nantmel, Radnor, is not as the name suggests a public house and has not been one for many years. It is situated off the main beaten track in the more remote upland area of Radnorshire. Roy Jones was not at home when I called but Mrs. Jones indicated where he could be found, a few miles away in the adjoining parish. On this particular day he was doing repairs to the roof of a house. A young-looking man with a grown-up family, Roy Jones spends much of his time away from his 27-acre farm.

The jobs he does range from fencing, draining and repairs to buildings to construction jobs and small modifications to farm houses. This work keeps him in the countryside and, as with his farming, gives him a great deal of pleasure as well as earning him money. He likes doing most of these jobs because of the craft and skills which they entail. The very nature of the work also provides a degree of flexibility which permits him to enjoy spare-time farming. Roy Jones, too, mentioned the husband and wife partnership which is so necessary for farming. Mrs. Jones is as keen and enthusiastic as her husband.

Farming business

To talk farming with Roy Jones is a stimulating mental exercise. The discussion ranged over farming business and the technical problems of his activities. His 27 acres lie on a rather heavy, damp-nature soil mainly suited to cattle. Traditionally this is important sheep country where it is difficult to visualize a farm without sheep; and there is, in fact, a flock of 30 breeding Kerry Hill and cross-bred ewes at New Inn. The farm, which attracts Hill Cow Subsidy, carries six breeding cows. Two extra calves are purchased and it is customary to sell eight, 15–18 months cattle in June each year. On average about 35 lambs are reared. The stocking density is about 1·7 acres per livestock unit which is a most creditable performance on this rather heavy, damp upland farm. In the farm business little guesswork is practised. Figures for fertilizers and seed, rationing and feedingstuffs used were readily available.

One aspect of livestock husbandry is worth mentioning since it signifies the interest and thought given to the stock on the farm, and at the same time gives some idea of the level of stockmanship. When the cows are turned out in the spring they continue to receive some mineral fortified concentrates for a period of a fortnight or three weeks, until such time as they have become attuned to spring grass. Care is taken to see that there are no abrupt and sudden changes in feed. The same applies to the sheep. In the autumn, ewes are gradually introduced to hay, and concentrate feeding, which starts in January, continues right through to lambing. The quantity given is gradually decreased until feeding ceases in May. Feed costs are average for the locality. One of the dangers inherent in farms of this size is the possibility of over-capitalization. This does not arise at New Inn. Machinery and implements include a nine-year-old tractor, a plough, cultivating machinery, a mower and trailer. All are maintained in good condition by the owner and depreciation and running costs per acre are low.

A well-paid factory job would not tempt Roy Jones to leave his small farm. With the services he has to offer he is an invaluable member of the local community.

Changing times

Dilwyn Probert, of Twynrhodyn Bungalow, Llanfillo, Brecon, was an apprenticed wheelwright when he went into the army in 1944. On demobilization in 1946 everything had completely changed and there was no longer any scope for his special talents. On his return he started work with a local builder, and in his spare time did repairs to machinery and farm trailers. He continues to do this and at the same time farm on a small scale.

In his father's day, Twynrhodyn carried a milking cow for the house, which also produced a calf for sale at eight weeks old. A breeding sow also provided weaners for people in the locality when the custom was for each house to have its own bacon pig hanging in the kitchen. With the interest and active assistance given by Mrs. Probert, spare-time farming is no problem. Of the 8 acres, 3½ are rented and the holding now supports four cows and a heifer. Five early spring-born calves are reared each year and are sold in the autumn at about ten months of age. The same customer buys the calves each year. Four acres of the farm are mown for hay and a further three tons are purchased. The fields are split into temporary paddocks which are rotationally grazed throughout the season. Grassland management is first-class. In addition to the farmyard manure, about £1 per acre is spent on fertilizers. Main costs items are purchased hay, concentrates and fertilizers. Machinery and implements comprise an old tractor, a trailer and a mower. Depreciation, repair and fuel costs are extremely low and total about £10 a year. The gross margin per acre is about average for a rearing cattle enterprise. Fixed costs are extremely low.

Recently a further seven acres of adjoining land has been bought. This needs drainage and when fully reclaimed poses the problems of what class of extra stock should be kept. If it is to be cattle livestock, then additional housing accommodation will have to be considered. Perhaps the extra stock kept will be breeding ewes, although Dilwyn Probert expressed no great enthusiasm or interest for sheep. What has this small farming enterprise to offer him? He has been brought up in the countryside and has a wife who is as interested as he is himself. He finds the holding a relaxation from his regular daily work. With his other spare-time activities, he finds it completely rewarding and satisfying.

Countrymen

Not all farmers or country dwellers are necessarily countrymen at heart. Many undoubtedly could be quite happy living in town and following some other occupation. These three spare-time farmers stated that they would be absolutely lost without being able to retain an active interest with the land. They are a part of the pattern of the countryside—a countryside which would certainly be much poorer without such men.

This article has been contributed by **A. W. Prowel, N.D.A.**, who is the N.A.A.S. County Agricultural Adviser for Brecon and Radnor. It follows a previous article by Mr. Prowel, *Spare-time Sheep Farmers*, which was published in the November, 1965, issue of *Agriculture*.

Farm Secretarial Services

as the farmer sees them

John H. Stevenson

In the interests of economy farmers nowadays are changing over to fewer and simpler systems of farming. There is a growing awareness of the need to ensure that the different enterprises on the farm are costed separately so as to make sure that one enterprise is not carrying another.

Many farmers will have been faced with the situation that modern farming requires certain business techniques, such as recording for management purposes, keeping accounts and conducting correspondence, and that these techniques are not normally available to him. The farmer has very little time to spare, and has to take care that he does not take up too much time in the office and so lose time outside; in any event he probably lacks the necessary secretarial skill. This situation poses a real problem. Farming businesses vary widely in their size, and many do not justify, and cannot support, a full-time secretary. The farmer is therefore faced with a problem that he cannot solve without the help of an outside agency.

Because his office work is of a complex nature, the farmer cannot normally use any shorthand typist to do it. A specially-trained person with the necessary background and skill, and whose services are backed by a responsible agency, is clearly the most suitable person. By taking advantage of the facilities offered by a part-time agricultural secretarial service, the farmer can choose how often, and when, he needs the services of a secretary. This arrangement brings a secretarial service within the scope of every farmer's budget. In addition to a secretary, the agency provides the necessary business equipment such as a typewriter and adding machine, which the farmer probably could not otherwise afford and which would not be used sufficiently to warrant its purchase in the first place.

Since 1963 I have been the chairman of a farm secretarial company which consists of a limited company directed by five farmers and one secretary (director-cum-employee); it will at once be clear that 'by farmers for farmers' is a good description of the company. My experience over the last three years has proved to me that part-time secretarial services can be of use to every farmer in the land—whether he admits it or not. And, of course, most of us are rather loath to admit that we need assistance but are pleased and relieved when we get it. As mentioned previously, the farmer chooses the frequency of the secretary's visits, weekly, fortnightly or monthly; and the type of work carried out by the secretary naturally depends on the frequency of the visits.

Work of the secretary

Regular jobs that the secretary will do are working out wages and preparing the wage packets, filing, correspondence and general clearing-up of papers and circulars. The secretary will also attend to insurance cards, pay accounts in time to claim discount, fill in subsidy forms and keep strict check on which subsidies have been paid and which are outstanding. She will also enter up the movement book, licence vehicles on time, and answer correspondence. She will keep records including enterprise costings (the latter will show how each part of the farm is progressing), also accounts and monthly stock and feed checks. There is, of course, no compulsory form of record-keeping, and the secretary will fit into the farmer's present type of recording unless requested to suggest alternative or additional systems. The latter has kept me on better terms with the auditors than I have ever been.

These jobs, with many more that will arise in the farm office, such as mapping drains, drawing plans, keeping field records and farm diaries, and keeping check on petty cash, make up the work of the farm secretary. She needs both skill and patience to deal with all these tasks and to hazard the effects of bad weather on us farmers.

The reluctance of some farmers to show their business operations to an outsider has, I have found, been largely overcome by the fact that secretarial services have been in business for some years now; the integrity of the secretary is vouched for both by the agency and her own wish to keep the job she has set out to do. It is also interesting to note that once a farmer joins one of these agencies he is very grateful to be rid of the chore of his office work; generally he comes to depend entirely on his secretary and has no wish to revert to his original system.

A great advantage of this type of service is that it is a chargeable expense for tax purposes. It also has the further attraction that it enables farmers to obtain grant under the Farm Business Recording Scheme. This Scheme at present covers a pilot area consisting of Cheshire, Norfolk, Staffordshire, the East Riding of Yorkshire and twelve counties in Scotland, but will be extended to the whole country during 1966. In Northern Ireland the Scheme is in operation but under somewhat different arrangements. Grants will be available in England and Wales and in Scotland to help farmers meet the cost of employing farm record-keeping businesses to maintain adequate records of their farm businesses. The Government's aim is to encourage the keeping of farm business records as an aid to sound management decisions.

Both with the introduction of the new grant and the rewarding feeling of being up to date with all the office work, I am sure most farmers will, like me, be grateful to farm secretaries all over the country for their hard work in a new and prospering profession.

(An article on Farm Secretarial Services from the secretary's point of view appeared in the April issue of *Agriculture*.)

This article has been contributed by **John H. Stevenson** who farms 550 acres near Melton Mowbray, Leicestershire, and who is chairman of Midland Farm Secretaries Ltd.

Market Intelligence

and Outlook work

in the U.S.A.

H. F. Marks

DECISION making, whether carried out by the farmer, the processor, or the trader of agricultural products, is more likely to be successful if all concerned have access to up-to-date and reliable market intelligence information, including likely future trends. Since many different types of decisions are necessary to the running of a business, careful interpretation of both short and long term trends is essential. The available information must be disseminated to all concerned as speedily as possible and in a manner suited to individual circumstances. Producers, processors and traders in the United States have been aware of the value of market intelligence and outlook statements for many years.

Techniques and agencies

Of special interest to a visitor from the United Kingdom are the techniques used to collect the information, and the speed and efficiency with which it is disseminated. Comparatively simple sampling techniques are often used for the collection of data, and co-operation by participants is usually voluntary. Many of the questions asked relate to the future rather than the past or present, and this is invaluable from a forecasting point of view.

The collection and dissemination of market intelligence and outlook material is carried out by both the Federal and individual State Governments. The work is undertaken in close co-operation between the different agencies, but the detailed arrangements vary from State to State. The Federal Government is normally responsible for deciding what information is required, when it is to be collected, and its interpretation. The State agencies normally collect and process the information before transmitting it to Washington D.C. The Federal Government publishes national estimates and situation reports, which are, in turn, used by the States as a basis for their own reports. The main organizations or departments concerned in the collection and dissemination of market intelligence and outlook information are the

Agricultural Census Bureau of the Department of Commerce, and the United States Department of Agriculture's Statistical Reporting Service, Market Reporting Service and Economic Research Service. All these agencies are, of course, closely co-ordinated.

Collection of information

The Agricultural Census Bureau is responsible for the collection and processing of the agricultural census which, unlike the United Kingdom census, is undertaken only every five years. The census varies in detail in different States and depends on climatic conditions, etc. The census covers many topics, including livestock, crops, land usage, machinery and fertilizer consumption, and relates not only to numbers and quantities, but also to the value of sales and to the cost of such items of expenditure as wages and rents. More than 300 questions are asked, compared with about 150 in our June census, and the form is completed by a Census Taker visiting the farmer. The completion of census questionnaires by farmers is compulsory. The figures derived from the census are used as the bases for the more up-to-date estimates which are made at frequent intervals. The estimates are revised in the light of the next census.

The Statistical Reporting Service is mainly concerned with the collection and dissemination of information on acreages, yields, livestock numbers and prices. Most of the information is collected by means of postal questionnaires and 'rural carrier surveys'. Considerable reliance has in the past been placed on the latter. The procedure is simple. The local postman is given a number of questionnaires and is asked to distribute them along his route. He is also responsible for the collection of the questionnaires. The sample is, therefore, hand-chosen and subject to bias, but this is not as important as might be expected due to the comparatively homogeneous nature of agriculture within a State. The response rate is, however, often low and a 10 per cent response in certain cases is regarded as satisfactory. This method of sampling is, however, becoming increasingly unpopular and most States have, in recent years, tried to devise better methods which can be used in conjunction with postal surveys. More recent methods, e.g., surveys which involve a complete enumeration of farms in areas chosen by means of random sampling, are also being experimented with. These can, however, only be used as checks because of their high cost.

Crop reports

The Federal Crop Reporting Board issues monthly 'Crop Reports'. Livestock information is included every month, but the crop information varies according to season. Estimates of 'plantings and yields' are revised monthly. The aim of the reports is to be as up to date as possible and every effort is made to incorporate the latest information. For instance, last-minute hurricane damage will, if necessary, be taken into account. The composition of the Board varies for the different crops and livestock. The personnel consist of permanent officials based in Washington and a rotating panel of officials from the various State offices. The Board works to a remarkably tight schedule and under conditions of great secrecy as any premature leakage of information could be of great value to dealers and traders. Work begins at 6 a.m. on the day it is intended to issue a report.

The information derived from the various States is considered and interpreted and the report is released punctually at 3 p.m. The reports are given the widest possible publicity due to the co-operation of Press, radio and television.

Market Reporting Service

The Market Reporting Service reports on livestock, meat and wool prices, as well as the supply and demand situation. The forty-three Market Reporting Service offices release up-to-date reports. Consolidated reports are also issued centrally from Washington, D.C. There is, as might be expected, a considerable amount of specialization. The New York and Philadelphia offices are largely concerned with the wholesale meat trade as both cities are large consuming centres. Baltimore deals with live cattle and meat.

The Market Reporting Service covers terminal markets, e.g., Chicago, which handles produce from several States, as well as the local auction markets. The market information is obtained in many different ways. The market reporters are, in all cases, expected to inspect a certain proportion of the livestock themselves. In the western range areas, the reporters visit feed lots and ranches. They also establish contacts with County Agents, bankers, livestock organizations, etc. All information is, if possible, checked with the buyer. The relative decline of the terminal markets has meant that direct trade reporting has become of greater importance in recent years. The Market Reporting Service insists that its reporters are well qualified. All reporters are graduates with degrees in animal husbandry. After an initial six months training in Washington D.C., the trainees are given at least one-and-a-half years practical experience with another reporter before being permitted to take over the reporting of a market.

The success of the service is primarily due to its ability to disseminate information rapidly. This is done partly by means of the 'leased wire system' whereby the Government pays an agreed sum for the use of the telephone system, irrespective of the number of calls made or distances involved. The 'leased wire system' is used to disseminate information as well as to deal with queries direct from the trade. The Reporting Service issues reports of its own which can be obtained by request, but great emphasis is placed on the dissemination of the information by the local Press, radio, and television. Great trouble is taken in tailoring the information to meet individual needs. In Chicago there are 159 radio and television broadcasts per week, which include the latest livestock situation. The 'leased wire system' also enables the latest reports to be given free of charge to the Press Association.

Situation reports

One of the main functions of the Economic Research Service is the publication of periodic 'Situation Reports'. A 'Livestock Situation Report' is published about every two months. Different commodities are, however, highlighted in each issue. The reports are essentially based on the data collected by the Statistical Reporting Service and the Market Reporting Service, although a certain number of personal contacts are also maintained.

The reports, which are mimeographed, are used mainly by farmers and advisory workers. They are of comparatively little interest to buyers, as buyers require more up-to-date information. Many of the large firms and

feed lots employ their own economists to keep abreast of current developments. No attempt has been made to build up large mailing lists for the 'Situation Reports'. The 'Livestock and Meat Situation' has a circulation of only about 8,000 copies. As in the case of other U.S. Department of Agriculture publications, it is considered that dissemination by the Press, radio and television is preferable.

'Outlook' meetings are also held whenever possible. These may take several forms. The State economists who specialize in outlook work may brief the County Agents and the latter may hold outlook meetings for producers. Sometimes the State economists may be used to brief producers direct. Much of the time of the State economists is spent in writing special articles for the local Press, etc.

Conclusion

What progress has so far been made in the United Kingdom in the dissemination of market intelligence and outlook information? Much of the required information is already collected by the Agricultural Departments, but only a limited amount is tailored to specific requirements. The Ministry of Agriculture, Fisheries and Food releases information on cereal supplies and estimated requirements and the Pig Industry Development Authority publish a 'Quarterly Economic Intelligence Summary', but little information of this type is available in the case of the other commodities. Much of the statistical data collected by the Agricultural Departments (especially market prices) is published by the Press, but the latter may often be reluctant to publish authoritative statements in their entirety. The United States Government supplies a large volume of information, which is often expensive to collect, free of charge to those who are interested. Its intelligent use has undoubtedly contributed to the great efficiency of agriculture, as well as other industries, in that country.

(An article on the collection and processing of agricultural statistics *in England and Wales* appeared in the June issue of *Agriculture*.)

This article has been contributed by **H. F. Marks, M.Sc. (Econ.)**, who is the Head of the Economics Department of the Pig Industry Development Authority. It is based on a visit he made to the U.S.A. in September, 1965, to study market intelligence and outlook work.

42. Wolverhampton, South Staffordshire

J. O. Emms

WHEN Staffordshire is mentioned, outsiders immediately think of locks and keys, coal mines, pottery, with some dairy farming interspersed in odd corners of an industrial county. This assumption in many cases is judged mainly from the rail route from Birmingham via Wolverhampton to Stafford. How wrong it is. This article describes the Wolverhampton district, essentially an intensively farmed arable area which covers some 100 square miles in south Staffordshire, most of the land lying west of the industrialized conurbations.

The district is bounded on the north by the A5 and the soil type here is mainly Keuper Marl, a heavy soil and very tricky to work, but ideal for grassland and wheat growing. This sets a pattern, therefore, for the farming, which in the main is dairying, with wheat, potatoes and barley as subsidiary enterprises. In this northern part of the district is the village of Brewood, originally the county town of Stafford, and although only some eight miles from the heart of the industrial Midlands it is characterized by its old oaks, dairy farms and farming estates, and nearby National Trust preservations.

On the western side of the district the pattern of farming is very similar to that found in the bordering county of Shropshire. The soil type becomes lighter as one travels south for some 22 miles to the Worcestershire border, where, in fact, some soils are virtually a blowing sand.

The centre of the district contains good, light land with a fair water table, where mostly cash crops are grown, farmed on a rotation of potatoes, sugar beet and barley. The dairy herds in this area, and to the south, are few and far between, and the grassland blocks in the rotation are usually utilized by grass-fattened beef cattle and sheep. This light land, although having no drainage difficulties, does sometimes suffer from water shortage; as a result there are many irrigation units in the area. This water shortage can be quite a problem, for there are very few sizeable rivers, only the odd canal, and few river tributaries to draw upon. Where the irrigation demands are quite excessive, as is to be expected with a large root acreage on light land, this has resulted in many farmers capitalizing in boreholes and reservoirs.

The town of Wolverhampton, with a population of 150,000, lies in the centre of the district, and its industrial interests spread eastwards into the true Black Country. Farmers, therefore, have a good direct market for

potatoes, pigs, sheep, beef and eggs, and this has set the farming pattern for the larger arable and small factory units. Most Black Country people know their 'King Edwards'; consequently this is the most popular maincrop potato variety grown in the area (there are some 6,000 acres of potatoes in the district as a whole). Although the area is densely populated, only a small proportion of this population is associated with agriculture. This in itself results in a high degree of mechanization on the larger arable farms in the south, and a swing to large-scale cash crop growing with very little livestock. The other main root crop is sugar beet. This is influenced by soil type, and as the Kidderminster sugar beet factory is only some ten miles from the southern end of the district, the difficulties of obtaining delivery quotas and long transportation are eased considerably.

A few farmers in the vicinity of Wolverhampton grow, between them, some 400–500 acres of black currants, which are in the main sold to the soft drink trade. To see a thousand people, all at one time, picking currants on a relatively small acreage, is quite a sight; and trying to organize transportation, discipline and co-operative working, is a work of art.

Large-scale barley growing is becoming more common and some farms are rapidly increasing in size. In many instances the farmers have sufficient resources to farm twice their acreages, and as land goes up for sale it is quickly taken up. Although the cost seems prohibitive at the time, as a rule the only extra items of cost are rent and fuel; usually the fixed costs per acre on the total or revised acreage are lower and turnover is increased considerably.

Where farmers have been unable to bring adjoining land into their system, many have started factory enterprises, such as poultry, pigs and barley beef, to try to turn their cereals into more money and to increase their size of business.

Compared with the rural west, the eastern section of the district has an outlook of pit mounds and opencast land with small industrial villages, and is densely covered with houses and factories. Therefore the farms tend to be on the fringe of this industrial belt. The soil series are mostly upper coal measures, a great deal of which has been undermined, with subsequent subsidence. The land which has not been undermined has been largely opencast, and the opencast land in this area now amounts to some 410 acres. The reclaimed opencast land is mainly in grass, but the rebuilding of soil structure is a problem. The farms in this area are smaller, usually around 60–70 acres, being dairy and stock farms with some arable units growing corn and potatoes. The potato crop is sometimes sold as a growing crop to potato merchants because of labour difficulties, or otherwise sold at the farm gate to townspeople. These are mostly family farms, employing solely family labour, with very low machinery costs, and are characteristic of this area only; the farm size in the western, central and southern sections of the district is in the 200–250 acre range.

It is pleasing to recall that a large proportion of the district is also well forested and farmed by one or two large estates. The character of the countryside around Boscobel and Chillington, which is recorded in history as the famous retreat for Charles II after his losing battle at Worcester in 1651, has been maintained. To the less fortunate town dwellers, it offers a very pleasant summer's evening drive, and to the agriculturist an area of immense variety.

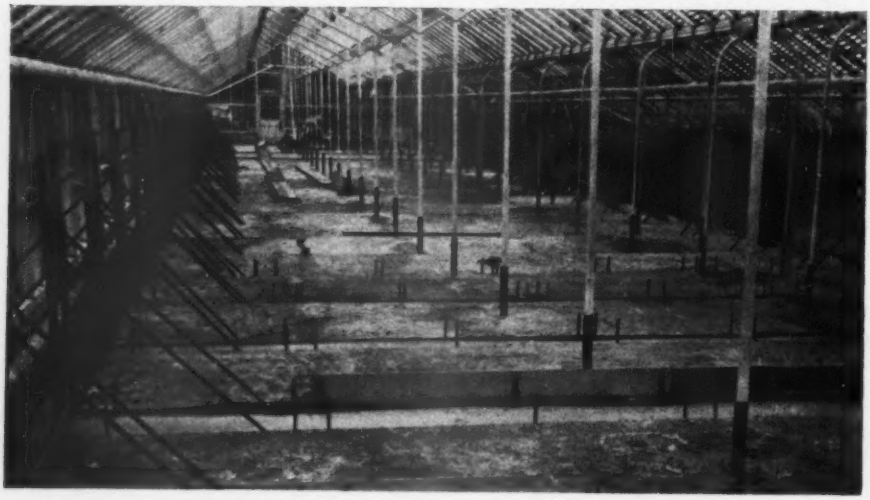
E. B. Mumford

Agricultural Land Service, Lewes

Concrete below Carnation Beds

CARNATION growing is a specialized branch of the horticultural glasshouse industry. Initially the crop may be grown in beds in the glasshouse border soil but, owing to its susceptibility to verticillium wilt, which results from a soil-borne fungus difficult to control, growing in natural soil becomes uneconomic within a few years. The use of concrete cropping beds is an effective method of overcoming the problem of wilt. It is, of course, no new method, having been practised as a remedial measure for over 20 years. The object is to grow the crop in sterilized wilt-free soils entirely isolated from the natural soil of the glasshouse and into which the plant roots cannot penetrate.

Concrete beds in course of construction



The usual method is to lay concrete over the whole floor of the house on which beds are made up, usually about 4 ft wide, alternating with concrete paths of 3 ft in width. The floor profile is a most important factor, and to facilitate drainage a gradual fall to one end of the house is required. In the beds themselves the surface should be laid to a slight end fall, and the surface should be cambered to the sides, the concrete at the bed centre being 1 in. higher than that at the edges. Concrete should be laid in a 1 : 2 : 4 mix, the minimum recommended depth of which is 3 in., i.e., 3 in. depth for the paths and the sides of the bed and 4 in. at the centre (See Fig. 1).

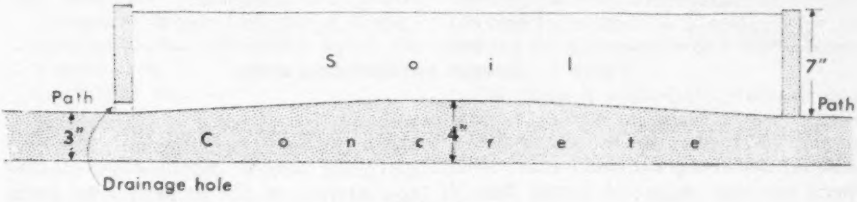


Figure 1.

Thinner skins of concrete have been used with some success. It must be remembered, however, that the concrete slab has to withstand any tendency to fracture under varying heat conditions, especially through application of steam for sterilization and pressures when working on the beds, i.e., during removal of soil, etc. Any fracture will nullify the whole operation by allowing roots to contact the original soil. Each bed is surrounded by a low 'wall' in order to retain the soil. This may consist of $1\frac{1}{2}$ in. to 2 in. thickness of *in situ* concrete, preferably reinforced, or of 7 in. $\times$ 1 in. nominal sawn boards, suitably treated, e.g., Tanalized. The latter are fixed by means of pipe clips to lengths of $\frac{1}{2}$ in. galvanized pipe driven about 12 in. into the ground. Some growers prefer to use a $\frac{1}{2}$ in. asbestos board for this purpose, fitted flush to the level of the soil to reduce the risk of accidental damage. Provision must be made at the base of the wall for drainage holes at intervals of about 3 ft.

Two further points should be noted in bed construction. Firstly, in order to minimize the risk of expansion and possible cracking, it is advisable to stop the concrete short of the outside walls of the house; 9–12 in. will be sufficient. Secondly, Portland cement can be attacked by sulphate-bearing waters and in concrete this means possible crumbling or breaking up. Fertilizers containing sulphate of potash are used in carnation growing, and this suggests that the use of a sulphate-resistant cement might be prudent. Some growers feel that the concrete bed involves a large capital outlay and on a temporary basis it has been found that a lining of 500-gauge polythene sheeting beneath the compost is effective. Polythene sheet may also be used for lining the concrete bed as an insurance against cracking. It may be that a layer placed over severe cracks would be sufficient for this purpose.

At the other end of the scale comes the elevated bed. This is supported about 4–6 in. above soil level and may be constructed of reinforced concrete, asbestos, or combinations of concrete, timber and polythene sheet. This type is the most expensive to construct, but it does obviate the risks of cracking and is worth considering if the level of disease in the particular house is

very high. A recent adaptation of this sort of bed uses hollow clay building blocks for the base laid at a greater slope than is usual. The base is supported on bricks and contained by concrete walls (See Fig. 2).

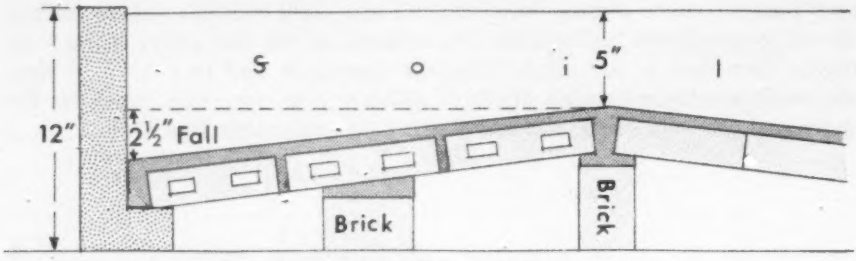


Figure 2. Elevated bed on hollow blocks

Recent tests carried out by the Ministry have established the fact that the temperature of 180°F (82°C) necessary for proper sterilization in the beds was not achieved at the face of the concrete of the ground level beds because of heat being rapidly conducted away by the mass concrete. This elevated bed should overcome the trouble and therefore meet the two main requirements of a concrete bed:

1. That efficient soil sterilization can take place.
2. Any cracking which might occur will not expose the roots to the risk of diseased soil beneath.

There is also an added bonus in that it would not be necessary to re-soil the beds.

OXFORD FARMING CONFERENCE REPORT

The papers presented to the 1966 Oxford Farming Conference in January of this year are printed in full in the Report and Proceedings of the Conference.

Copies may be obtained from M. H. R. Soper, Department of Agriculture, University of Oxford, price 10*s*. (including postage).

Books

The Biological Significance of Climatic Changes in Britain. Institute of Biology Symposium No. 14. Edited by C. G. JOHNSON and L. P. SMITH. Academic Press, 1965. 42*s*.

The weather is a subject of perennial interest to the countryman and in recent years much has been written about the effects of past weather on crop yields and prices. Forecasting future weather plays a big part in the day-to-day activities of the farm, and John Claridge gave us the Shepherd of Banbury's Rules in 1670 in order that we might know the weather for several days to come and in some cases for months. The Symposium under review was not concerned so much with the day-to-day changes but with the long-term changes in climate which are taking place at the present time.

The Symposium was organized by the Institute of Biology and was held in London during October, 1964. Twelve contributions were presented on various aspects of the problem, and these are all included in the published work together with a record of the discussions. The main object of the Symposium was to review the changes that have occurred in the past in order to see if it were possible to gauge the changes that might occur in the future.

The opening contribution, by H. H. Lamb, gives a broad outline of the climatic changes which have occurred over the centuries and includes, in more detail, the changes which have taken place since the start of the century. The subsequent papers cover a wide field and attempt to see if any evidence of change associated with these trends can be detected in the British flora, in the distribution of marine algae, in the composition of marine communities, and in the fisheries of the northern hemisphere. These papers range over such subjects as the distribution of ice in arctic regions; the distribution of vineyards in England; soil profiles; and the catches of cod off Greenland. The wide approach makes interesting reading and shows how far-reaching are the effects of climatic trends.

The agricultural significance of climatic changes is dealt with from several angles, and one is impressed with the way in which the forage grasses are adapted to the climate of the areas in which they are found. The evidence as far as stock are concerned is not so convincing; the trend over the years has been to modify the environment rather than to select for specific ecological conditions. On the more practical side L. P. Smith attempts to sum up some of the possible changes in seasonal weather, and Professor Duckham deals specifically with farming and short-term changes in climate. On the whole there is a tendency for all systems to become less and less weather sensitive.

The book is attractively produced and there is no lack of figures to help in the understanding of the text. The subject dealt with is a fascinating one, and the book should stimulate thought and work on problems connected with long-term climatic changes. The organizers are to be congratulated on attempting to deal with a very difficult subject which affects every one of us.

I.F.S.

Profitable Sheep Farming. M. McG. COOPER and R. J. THOMAS. Farming Press, 1965. 35*s*.

This book has been jointly written by Professor M. McG. Cooper, Dean of Agriculture, and Mr. R. J. Thomas, Lecturer in Animal Health, at the University of Newcastle upon Tyne. In the section headed 'Production and Management', which is by Professor Cooper, the writer stimulates producers to re-examine the potential of our sheep population when geared to developing husbandry techniques. This part details flock selection and management from weaning to lambing and right through to weaning again, over the length and breadth of sheep farming practice, whether on the lowlands or the hills.

In the chapters headed 'Hygiene and Control of Diseases', Mr. Thomas covers parasitic and infectious diseases, and mineral and metabolic disorders. Emphasis is laid on the need to maintain flock health, and a refreshing approach is made to preventive medicine. This part knits in well with the major contribution on 'Production and Management'.

The farming relevance of the book is in its successful attempt to bring together those facets of sheep husbandry which,

when synthesized into farm practice, will increase the competitive claims of sheep during a period when returns from the 'golden hoof' lag behind those from other farming enterprises. Although there are pointers towards new technological changes, the main purpose of the material is to underline the need to apply existing knowledge, but at a higher level of intensity.

The book will appeal to those concerned with sheep production at all levels. Its contents provide a most important key in the process of unlocking our flock and grassland resources towards higher productivity. Not only is it easy to read, but what it conveys demands positive action, because of the common sense that prevails throughout.

T.J.C.D.

Portrait of Yorkshire. HARRY J. SCOTT. Robert Hale, 1965. 21*s*.

Natives and lovers of Yorkshire everywhere will welcome this book from the pen of Harry J. Scott, who is well known in his capacity as editor of *The Dalesman*—Yorkshire's own magazine—a post he has filled for a quarter of a century.

No other county is so large or so varied as Yorkshire, with its contrasts of scenery and occupation from the North Sea coastal lowlands of Holderness to the Pennines, from the remote fells to the industrial conurbations in the Yorkshire coalfield. To attempt a topographical portrait of so vast an area is a formidable task, but Mr. Scott has a profound knowledge of his subject and has covered his canvas with a wealth of colour, which is surprising in its very detail. There seems to be no field and no street which has not carried his foot at all seasons of the year and remote villages, equally with larger towns and cities, have borne witness to his observant eye and understanding ear. To include so much within the compass of one volume and for it not to read like a catalogue is indeed an achievement, and is only accomplished by an economy of expression which is to be admired. Every sentence is loaded with information and not a word is wasted.

Many of the places and events in the book are themselves subjects of volumes in their own right; yet *Portrait of Yorkshire* is complete in itself. Even so, those who thirst for more knowledge will find source and reference to pursue their interest elsewhere.

The county is steeped in history and the author includes a wealth of historical background on all places mentioned. But he also touches on the latest rural community matters. Legend, anecdote, folk-lore and fact thread an interesting course through the narrative.

This cannot be described as a farming book, yet agriculture is frequently mentioned *en passant*. There is reference along the journey to the general types of farming found on the fells, on the moors and in the lowlands. Many places visited owe their existence to agriculture and are market towns, or have been in the past. Interesting facets noted here and there include the building of dry stone walls, the Yorkshireman's love of horses, Wensleydale cheese and the gaiting of sheep on the moors. Sheep have played a dominant part in developing the county from the earliest times, and it is pleasing to find so many references to them and a whole section devoted to the wool textile industry.

Criticisms are few, but so much is mentioned in the book that it is a pity rhubarb and liquorice are omitted completely. One would hardly extend even the edge of the Plain of York as far north as Rosebery Topping.

The volume is written for lovers of Yorkshire generally and not for one section alone. As such it will have a wide appeal and should find its way into bookcases both at home and further afield.

J.H.C.

T.V. Vet. Book for Stock Farmers No. 2: Calving the Cow and Care of the Calf. Farming Press, 1965. 35*s*.

This publication is well presented, consisting of 160 pages with a very large number of useful illustrations, and is conveniently divided into 24 sections dealing with all aspects of calving and after care of the calf. In the author's preface he suggests that all farmers, stockmen, students and young veterinary surgeons—in that order—will find the publication of inestimable value, and emphasizes that the book is based on personal observations and practical experience.

The book naturally divides itself into two parts: one deals with calving the cow and the problems associated with this phenomena and the remainder of the book deals with the care of the calf. Both parts contain much sound common sense but the author tends to suggest throughout the text

that the methods set out are the best and only ways of dealing with the situations described. There may well be other equally successful systems in operation among both veterinary surgeons and stockmen throughout the country. If the reader does not bear this in mind he may get the impression, quite wrongly, that his own veterinary surgeon is not doing the 'correct thing' for his animals. It might, therefore, have been better had the author concentrated on instructions to the farmer and herdsman which would have emphasized what should be done before the veterinary surgeon comes, and left out many of the more vivid details of veterinary treatment which can hardly be covered adequately in such a publication.

The text shows an expert knowledge of dealing with the cow at calving time, and the author goes out of his way to suggest that any malpresentation is the job for a qualified veterinary surgeon. This is advice to take and to be kept in mind when reading the whole publication, especially with the value of dairy cattle at the present time.

The sections dealing with malpresentation might be a little difficult to follow in some cases, especially when the person reading it has never been confronted with such problems. The section dealing with the third stage of normal birth—the expulsion or removal of the afterbirth—would perhaps appear to be too clear cut. The retention of the placenta could well be for other reasons not understood or explained.

Controversy has always surrounded the author's advice on time to be allowed for a normal animal to go through the proper stages of preparation for calving, and this publication suggests giving time if the calf is expected to be presented in the normal way. For the normal presentation and delivery of the calf, the suggestions set out on how to provide assistance are very useful and the stress laid on cleanliness during such operation is commendable. Many of the pictures show that the operator himself might, however, make more use of protective clothing.

The section which deals with the care of the calf takes up 54 pages, is well set out and covers all the problems involved in calf management. The book has come out at the right time to demonstrate what can be done to help save calves; and stockowners, and those responsible for calf management, can be recommended to read the section carefully.

The up-to-date use of vaccine to prevent salmonella is mentioned but some of the other treatments could well date fairly quickly and it might have been as well not to mention them by name.

The book provides a most useful first-aid guide for stockowners and contains a great deal of personal advice which can be interpreted according to the reader's ability. For those who would rather get their instructions from pictures, this is an ideal publication.

G.F.S.

Farming and Food Supplies. MARGARET BRAMLEY. Allen and Unwin 1965. 20*s*.

This book could hardly be more timely, for it is sub-titled 'The Case for Expansion of British Agriculture', and expansion is very much in the air at the moment, with the publication of the National Economic Development Plan. But timely though it is, it also illustrates the unforeseen difficulties that may lie in wait for those who presume to chance their arms and write on future policies, for this book was clearly written before the White Paper entitled 'The Development of Agriculture' and the National Plan were issued last year. In the event, some of the circumstances surrounding the argument have changed, and some of the ideas put forward have been accepted, at least in part.

Nevertheless, the book is a valuable addition to the rather scanty literature on the subject of agricultural policy in this country. It is divided into three parts in which the role of agriculture today, the potential for expansion and the relation of this country to other food suppliers and the needs of under-developed territories, are separately examined.

The first part, establishing the value of home agriculture, perhaps echoes the N.F.U. line too closely and uncritically. For instance, share of national income is usually regarded as a better guide to an industry's size than gross output, especially where large imports of raw materials are concerned. But nevertheless, a good case is made out.

The second part, on the potential for expansion, is good, but here again a somewhat uncritical approach is taken to the range in management ability existing today. Of course, if all farmed at the level of the best the output would be fantastic, but if we could all run as fast as Snell we should win the Olympics every time. Range will always be with us; all one can do is to try to narrow it.

The last part is the most important. It puts forward the need for expansion at

home on the grounds that the era of cheap food from abroad is over and that, as the needs of other areas increase and force up prices, so we must expand to supply more of our own, and also to release food for others. There is much in this, though it does no good to the case to inject emotion, as on p.119, in an attack on an economist stating an elementary principle. If you do not like the results of a principle you can set out to change them, but that does not make the principle wrong.

But few would quarrel with the main contention, that our agriculture is both capable of expansion, and that this expansion, or some of it, is now required. What some would not agree with is that this means higher producer prices to get the expansion, and so give farmers a higher income. The same results could be found from a rationalization of the industry, as the recent White Paper has suggested.

D.B.W.

Books Received

Barley Production in Devon and Cornwall in 1964. Farmers' Report No. 2, Department of Agricultural Economics, University of Exeter, 1966. 2*s*.

An Economic Study of Pig Production in South West England 1964–65. Report No. 158, Department of Agricultural Economics, University of Exeter, 1966. 2*s*. 6*d*.

Documentation in Agriculture and Food, No. 78. Training of Advisers in Agricultural Marketing. Organisation for Economic Co-operation and Development, 1966. 15*s*.

European Brewery Convention. Report of the Barley Committee on the 1964 Trials. The Institute of Brewing, 33 Clarges Street, London, W.1. 15*s*. (including Postage).

Farm Implement Buyers Guide. Farm Implement and Machinery Review, 28 Essex Street, London W.C.2. 10*s*. (by post 11*s*. 1*d*.)

A Bibliography of Farm Buildings Research. Part II—Buildings for Potato Storage, 1st Supplement, 1958–64. Agricultural Research Council, 1966. 5*s*.

Profitability of Farming in the North of England, 1964–65. S. Robson. Department of Agricultural Economics, University of Newcastle upon Tyne, 1966. 3*s*. 6*d*.

A Guide to Farm Investment in Bulk Milk Collection. G. F. C. Mitchell. Department of Agricultural Economics, University of Bristol.

Report of the School of Agriculture, University of Nottingham, 1965.

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ANIMAL NUTRITION

P. McDonald, R. A. Edwards, J. F. D. Greenhalgh

The authors of this book worked together at the Edinburgh School of Agriculture. It is based on their experiences in the teaching of Animal Nutrition and in dealing with the problems of feeding livestock. Biochemical aspects and the theoretical bases of nutrition have been emphasised. The authors have drawn upon the recommendations of the working parties set up by the Agricultural Research Council to bring up to date the accumulated knowledge on the subject.

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Salary scale £1,180—£2,600 a year for degree holders; £945—£1,855 a year for diploma holders, plus 25% terminal gratuity. A supplement ranging from £200 to £300 a year is also payable direct to an officer's bank account in the United Kingdom or the Republic of Ireland. Passages provided. Education allowances. Government quarters. Three years' contract.

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M. A. TELFER, *Registrar.*

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The officer appointed will also be required to undertake the supervision and training of junior laboratory staff.

Candidates must hold a degree (or equivalent qualification) in Chemistry, together with post-graduate experience relating to the duties outlined.

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Required for the administration of an Agricultural Division, comprehensive advisory and supervisory duties and supervision of experiment stations and staff training.

Candidates must hold a degree in Agriculture or Natural Science, plus at least two years' experience of tropical Agriculture.

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Candidates must hold a degree in zoology plus two years post-graduate training or approved experience.

Salary scale £1,616—£2,700 a year (this includes an inducement allowance of 66⅔% of basic salary) and a terminal gratuity. Education allowances. Children's allowances. Passages provided. Government quarters. Generous leave. Three year contract.

Candidates should apply for further details, giving brief particulars of qualifications and experience, quoting RC 213/25/06 to:

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AGRICULTURAL OFFICER
SWAZILAND

Required for general advisory duties and land use planning in a district.

Candidates must possess a degree in agriculture with either post-graduate training or experience.

Salary scale £1,284—£2,556 a year plus 25% terminal gratuity. Passages provided. Government quarters. Education allowances. Three year contract.

Candidates should apply for further details giving full name and brief particulars of qualifications and experience quoting RC 213/169/014 to:

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TANZANIA

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Candidates should possess a degree in agriculture followed preferably by post-graduate studies in water/plant relationship, plus 3 years' experience in irrigation farming practices.

Salary scale £1641–£2757 a year plus 25% terminal gratuity. Passages provided. Education allowances. 21–27 months contract. Generous leave. Government quarters.

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ZAMBIA

Required to take charge of field planning teams and to be responsible for regional conservation planning on a catchment and/or settlement plan basis.

Candidates must have a degree in agriculture or natural science, preferably with post-graduate training and/or experience in the use of aerial photography, practical surveying and land use planning.

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Qualifications: Degree in agricultural economics with background knowledge and experience of development plans and evaluation projects.

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